Governance of Inter-sectoral reallocation of water within the context of Urbanization in Hyderabad, India

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Zusammenfassung

Der intersektorale Wasserkonflikt zwischen urbaner und agrarischer Wassernutzung in Hyderabad und die Konkurrenz zwischen den Bedürfnissen der Stadt und den Ansprüchen der Landwirtschaft werden verschärft durch willkürliche Verteilungspraktiken, die den offiziellen Zuteilungsrichtlinien oft widersprechen. Übersetzt in die Sprache von Ostrom, gilt die vorliegende Untersuchung der Kernfrage, warum bestimmte praktizierte Regeln (rules-in-use) fortbestehen, obwohl formale Regeln (rules-in-form) im Bereich der Nutzungsrechte an Wasser vorhanden sind. Ostroms Institutional Analysis and Development Framework (IAD) identifiziert exogene Variablen und deren Einfluss auf die Rolle von Institutionen, durch die die Interaktionen und Entscheidungsprozesse von Menschen gestaltet werden. Die Arbeit versucht dementsprechend zu erklären, wie bestehende Institutionen und Governancestrukturen die Interaktionen beteiligter Akteure und deren Verhalten beeinflussen und wie daraus eine durch Willkür gekennzeichnete Umverteilung erwächst. Knights Verteilungstheorie institutionellen Wandels und sein Ansatz über Machtressourcen vermögen zu erklären, wie menschliche Interaktionen in Zusammenhang mit solchen Konflikten über begrenzte Ressourcen zustande kommen. Die zentralen Ergebnisse der Untersuchung weisen darauf hin, dass 1) eine sektorübergreifende Planung von Wasserzuteilung und -managements im Bundesstaat Andhra Pradesh fehlt, 2) die Beteiligung landwirtschaftlicher Akteure zu gering ist und eine Machtkonzentration bei staatlichen Akteuren vorliegt, 3) die Sanktionierung von Verstößen gegen regelwidriges Verhalten zu schwach ist, 4) die Auswirkungen klimatischer Schwankungen auf Wasserressourcen und deren Verfügbarkeit bei der Planung und dem Management von Wasserressourcen stärker zu berücksichtigen sind. Die Ergebnisse der Arbeit zeigen ebenfalls, welche Wirkungen die Charakteristika verschiedener Gruppen von Wassernutzern und deren spezifische Abhängigkeit von Wasserressourcen auf ihre Fähigkeit zur politischen Einflussnahme ausüben. Solche Ausprägungen von Ressourcenabhängigkeiten bedingen Machtasymmetrien und erhöhen das Ausmaß willkürlicher Umverteilungen von Wasser. Die Untersuchung identifiziert eine Literaturlücke im Bereich der Politik der Wassergovernance, indem sie den Wählereinfluss als Machtressource im Land-Stadt-Konflikt um Wasserressourcen empirisch belegt. Die Arbeit zielt insgesamt darauf, das Erklärungspotential von Eigentumsrechtstheorien zu nutzen und anhand von Wasserkonflikten in Hyderabad ein Beispiel zur Anwendbarkeit aktueller Theorien institutionellen Wandels zu geben.

Abstract

Hyderabad's inter-sectoral water conflict and competition between the city's urban needs and the agricultural sector have been fueled by persistent arbitrary water reallocations against the prescribed allocation guidelines. To translate the key question into Ostrom's language; this study seeks to unravel the persistence of rules-in-use, despite the rules-in-form already in place within the realms of property rights. Ostrom's Institutional Analysis and Development framework identifies exogenous variables and its influences on the role of institutions which shapes human interaction and decision making processes. It attempts to explain how the existing water-allocation mechanism has propagated the way rules and actors currently interact to influence such arbitrary water re-allocation. Knight's distributional theory of institutional change and his concept of power resources provide good explanations of human interaction in the context of such conflicts over limited resources. Key results indicate 1) Lack of inter-sectoral planning and co-ordination in water resource allocation and management in the state of Andhra Pradesh, 2) Too little participation of farming actors and too much power vested in state actors, 3) Weak sanctions for violation of water management and regulations, 4) The need to consider the impact of climate variability on water resources and its availability while planning and management of water resources in Andhra Pradesh. The study results also reveal how the characteristics of water-user groups and its dependence on water resource have the ability to exert political influence over water allocation. Such attributes of resource dependence characterizes power asymmetry, thereby increasing the scale of arbitrary water reallocations. Henceforth, this study addresses the gap in 'politics of water governance' in existing literature by empirically deriving 'political electorate' as a power resource in rural-urban water contestation. Overall, this study seeks to employ the theoretical explanations of property rights and attempts to provide a case on the applicability of contemporary theories of institutional change by taking the case study of Hyderabad's water contestation.

Schlagwörter: intersektorale Wasserkonflikt, Knight's distributional theory, IAD Framework, wassergovernance

Keywords: inter-sectoral water conflict, Knight's distrubutional theory, IAD Framework, water governance

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List of Abbreviations

APFMIS	Andhra Pradesh Farmers' Management of Irrigation Systems
APWALTA	Andhra Pradesh Water, Land and Trees Act
APWRDC	Andhra Pradesh Water Resources Development Corporation
BCM	Billion Cubic Meters
CADA	Command Area Development Authority
CGWB	Central Ground Water Board
CPCB	Central Pollution Control Board
CPHEEO	Central Public Health and Environmental Engineering Organization
CWC	Central Water Commission
FO	Farmers Organization
GBM	General Body Meeting
GHMC	Greater Hyderabad Municipal Corporation
GoAP	Government of Andhra Pradesh
GO	Government Order
GoI	Government of India
GWDT	Godavari Water Disputes Tribunal
HMWSSB	Hyderabad Metropolitan Water Supply and Sewerage Board
HRC	Human Rights Commission
HUDCO	Housing and Urban Development Corporation Ltd
IAD	Institutional Analysis and Development Framework

IandCAD	Irrigation and Command Area Development
KWDT	Krishna Water Disputes Tribunal
MAUDD	Municipal Administration and Urban Development Dept
MCH	Municipal Corporation of Hyderabad
MGD	Million Gallons Per Day
MoEF	Ministry of Environment and Forests
MoWR	Ministry of Water Resources
MP	Member of Parliament
MLA	Member of the Legislative Assembly
MCM	Million Cubic Meters
Mm3	Million Cubic Metres
NWP	National Water Policy
NRM	Natural Resource Management
NSP	Nizamsagar Project
NRCD	National River Conservation Directorate
PC	Project Committee
PHED	Public Health Engineering Department
PWD	Public Works Department
RWA	Resident Welfare Association
TDP	Telugu Desam Party
TNRMG	Telangana Natural Resource Management Group

UFERWAS	United Federation of Resident Welfare Associations
UWS	Urban Water Supply
WUA	Water User Association

Dedication

I dedicate this thesis to my most loving family the “S. Jakhalus”

Preface

First of all I thank the Almighty God for being the strength and guiding light in every sphere of my life.

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1 Introduction: Inter-sectoral Competition for Water Resources

Overview

The competition and conflict of Hyderabad's urbanization and its inter-sectoral water contestation with agriculture is the focal attention of this study. As a result of rapid urbanization around the world, water is being transferred to the cities out of the pre-existing multiple-use water sources. Conflicts under such circumstances are receiving considerable attention in water resource management (van Veenhuizen, 2006; Celio and Giordano, 2007; Meinzen-Dick, 2006; Molle and Berkoff, 2006; Saleth and Dinar, 2001). However, much of the existing literature focuses on technical aspects of allocation of such water transfers without adequate attention to institutional frameworks required for any form of water allocation (Bruns and Meinzen-Dick, 2005: 9). Handling such conflicts and sectoral rebalancing is a major concern in the literature of water resource management. Whilst it is almost imperative to have new institutions to deal with such problems, however, what form these institutions should have and when and how they should be put in place is still a highly contested issue (van Veenhuizen, 2006). Hyderabad is a typical example of such inter-sectoral conflicts with the agricultural sector. Water allocations between these two competing sectors are administratively prescribed with allocation guidelines in place. However, arbitrary reallocation of water against the prescribed guidelines has been persisting over the years with detrimental consequences to both Hyderabad's drinking needs and irrigation water for the agricultural sector. In this light, this study seeks to examine the institutional context of the 'water allocation mechanism' in place and the underlying process of the interplay of water-related actors and rules, and the dynamics of factors which eventually propagates such arbitrary water reallocations.

1.1 Hyderabad's Inter-sectoral Water Contestation: an Institutional Problem

A long body of work exists where scholars have undertaken an interesting range of studies on inter-sectoral contestations of water in the context of Hyderabad urban water. Saleth and Dinar (2001) examined the shortcoming of the universal application of a market-based approach to such inter-sectoral water transfers by empirically demonstrating this by taking the case of Hyderabad. They identified the importance of economic and institutional conditions necessary to ensure the viability of such inter-sectoral water transfers, whether market-based

or otherwise. Van Rooijen et al. (2005) studied the impacts of urban growth on the agricultural sector by examining the water balance of the city of Hyderabad, giving an insight into long-term trends in the impacts of urban growth on agricultural water use. While reviewing the inter-sectoral transfers around the world, Molle and Berkoff (2006) cited Hyderabad as a representative case in which the urban sector out-competed the irrigation sector to meet the increasing urban water demands by administrative allocation mechanism.

Also highlighting Hyderabad urban water transfers and its associated persisting conflicts, Venot et al. (2007) underlined the importance of water being a disputed and highly politicized object, strongly shaped by the social and political conditions of the region. Studies on developing the city water balance model for Hyderabad by George et al. (2009) has also been undertaken on the account of poor water supply and increasing demand in the urban area. Similar studies have been carried out by Van Rooijen et al. (2009) to assess current and future water demand in the Krishna basin. Davidson et al. (2010) developed a model to study the economic impacts on the agricultural producer along the Krishna River when water was transferred to Hyderabad from the Nagarjuna Sagar dam. Van Rooi-jen et al. (2011) also investigated the water allocation to Hyderabad and its implication on the catchment area of two irrigation projects from where water was being reallocated. This study emphasized the need to take into account the importance of local and national politics and stakeholders involved in driving these water allocation practices.

However, it was Celio and Giordiano (2007) who highlighted the institutional failure by characterizing the shortcoming of such allocation rules that governed these agricultural-urban water transfers, whereby water allocations were arbitrarily taking place overruling the administratively prescribed allocation guidelines. Due to high dependence on agriculture for livelihood, it manifested the persisting conflicts and competition between the rural and urban sectors. Celio (2009) further elaborated the appropriation of water by Hyderabad and the impacts it had on agriculture. He also underlined the importance to carry out an in-depth analysis of the political interplay of water allocation through the lenses and frameworks within the realms of political science, for further research. Taking up on the illustrious work of the scholars working on Hyderabad's urban inter-sectoral water as a highly contested issue, this study revisits the mechanism of these urban water transfers facilitated by the urban water reforms. It specifically attempts to examine the underlying fundamental basis of why such

arbitrary water reallocations against the prescribed allocation guidelines have taken place over the years.

1.2 Objectives of the Research

Bruns et al. (2005) explains that an increase in scarcity of resources also increased the likelihood of competition, wherein property rights could clarify expectations and reduce conflict between users over a resource. Shiferaw (2009) further stresses the importance of getting the property relations right which seems to be more needful for water reforms. This lays the foundation for the study: assuming that we manage to get the relationship among water sharing parties right, then there is a possibility for almost all the problems to be resolved by the various parties exercising those rights. Therefore, it becomes almost imperative for this research to delve further into the institutional content of these evolving water reforms and the property rights provision for both users (city and agriculture) to facilitate such transfers, and the outcome it eventually has such inter-sectoral allocations.

To examine why such an unstable inter-sectoral allocation mechanism exists that is detrimental not only to Hyderabad's drinking needs but also for the agricultural sector, this study rests on the theoretical foundation of property rights. Thereafter, this leads to the following research inquiry to investigate the influencing factors under which governance of water allocation eventually change (institutional change) to cause such arbitrary reallocations. How water-related actors interact to negotiate and bargain to eventually secure water for themselves against the prescribed allocation guidelines is specifically examined. The essence of this study rests on these arbitrary reallocations that have a complex web of implications of water security not only for agriculture and rural livelihoods but also for urban drinking water. Therefore, within the backdrop of change in the dynamics of urbanization, agriculture and water variability, the key research question seeks to address *"how has the water allocation mechanism in place propagated the way rules and actors currently interact to influence and employ strategies that eventually causes arbitrary reallocation of water resources?"* This study attempts to answer the key research question by the following sub-questions:

- Who are the water-related actors involved in the inter-sectoral water allocation and management and their relation with statutory powers (Legislative/

Constitutional/Legal power) over waters entrenched in the Government water law framework? Subsequently, how have water-related actors positioned themselves informally to participate in allocation and management of water resources?

- What are the evolving water institutions and the dynamics of the property rights provision of the two competing sectors (urban and the agricultural sector) that has facilitated such inter-sectoral arbitrary reallocations of water resources over the years?

- Under the circumstances of water scarcity, how do these water-related actors interact and what influence do these water-related actors employ in the process of negotiating and bargaining to secure water for themselves to eventually cause arbitrary reallocation against the prescribed allocation guidelines?

- How has the historical and political context influenced the dynamics of such arbitrary water reallocations that has persisted over the years?

This study seeks to unravel the factors of how and why water-related actors break formal rules, to create their own rules and eventually play their own game of water allocation in Hyderabad's context. To succinctly translate the key research question of why such arbitrary reallocations persist against the allocation guidelines into Ostrom's language, this study seeks to examine the persistence of rules-in-use, despite the rules-in-form already in place. The Institutional Analysis and Development (IAD) framework developed by Ostrom (1982; 1990; 2005; 2011) is employed for this study, as it provides a good platform for guiding such research studies of rules-in-use and rules-in-form (Carter and Weible, 2014; 2016: 175; Siddiki, 2012: 8). The study also uses Knight's (1992) concept of power resources, as it provides a good explanation of human interaction in the context of such conflicts over limited resources (Acheson and Knight, 2000; Theesfeld, 2004). Overall the study seeks to employ the theoretical explanations of property rights within the realms of the IAD framework and attempts to provide a case on the applicability of contemporary theories of institutional change to the context of water resource management in Hyderabad.

1.3 Scope of the Study

Whilst investigating any ‘problem’ there are inherently many interconnected causes and relational issues, but it is of paramount importance to distinctly define the boundaries and the scope to which any study is attempting to address. The core focus of this thesis is on the persistent ‘inter-sectoral conflicts’ in the allocation of water between drinking needs for Hyderabad and irrigation needs in the agricultural sector. Hyderabad essentially gets its water from five sources, but only those sources which share its water with the agricultural sector is taken into account for this study (i.e. Singur dam across Manjira River and Nagarjuna Sagar dam across Krishna River which supplies 80 percent of the water to Hyderabad). Henceforth, the site selection for data collection focuses in those villages that fall under the catchment areas of these irrigation projects (that share water with Hyderabad), thereby partaking in the process of competition and conflicts in securing water. It may be noted that the Hyderabad water supply system mainly depends on surface sources. The groundwater sources within the city which are mostly developed by private parties are barely able to meet just about 6 percent of the projected water demand of the city (Hyderabad Metropolitan Water Supply and Sewerage Board, 1995a). However, in the study context since the subject of study is on competition for surface water sources, ground water is not taken into consideration. Also, the two water sources, Osman Sagar and Himayat Sagar which supply about 20 percent of the water to the city is also refrained from coming to focus in the study. These two sources were originally constructed solely as drinking water reservoir for Hyderabad and do not share water with any other sector and hence falls beyond the purview of the study. Therefore, it is only those contested water sources which supply to both Hyderabad and the agriculture sector which is taken into consideration to carry out this research.

1.4 Structure of the Study

Chapter one introduces the research study, outlining the rationale, research objectives, research questions and the scope of the study. Chapter two describes the study context in details. It opens with the global review of 'urbanization versus agriculture' by taking Hyderabad city as a representative example. This is followed by an overview of the two competing sectors, underlining the ‘competition-conflict-reallocation’ nexus. It essentially explains how the increasing urbanization of Hyderabad and its growing demand for water has

subsequently put pressure for competition of water with the agricultural sector. The timeline of Hyderabad water issue is thereafter chronicled to set the historical and political context of the study. This chapter systematically charts the historical account of the shift of customary water rights to the Indian state and also describes the provision of water rights in India in the current context. Water in the Indian Constitution helps us to construct the study context relating to water jurisdictions for irrigation and urban drinking water sectors, as well as the water-related actors at the central and the state level in Andhra Pradesh. This chapter finally throws some light on the concepts of property rights and categorizes the institutional arrangements for water allocations and the type of water transfer under which Hyderabad falls.

In Chapter three, the theoretical strand applicable to the study context of Hyderabad is presented. This chapter opens with a theoretical perspective on the definition and origins of property rights pertaining to the Institutional Analysis and Development (IAD) framework. It further explains the role of property rights in conflicts in natural resource management. In order to study such conflicts; the definition of institutions and institutional change is conceptualized. Thereafter, conflicts and institutional change in Knight's theoretical concept is explained. Finally, the Institutional Analysis and Development (IAD) framework and its applicability to carry out the research in Hyderabad are elaborated.

Chapter four presents the methodological approach. Taking Hyderabad's context, this chapter presents the practical aspect of designing and conducting the research work. First, it defines the rationality of choosing the case study approach to carry out the research study and explains what purpose it serves from an epistemological point of view. The study region in various parts of Andhra Pradesh for data collection is described in detail. Then the empirical methods employed to carry out the case study research are presented. This starts with the data collection which primarily includes document analysis and interviews and finally describes the method to analyze the data collected.

Chapter five presents the results from the case study research on site. It uses the Institutional Analysis and Development (IAD) framework in order to structure the findings and assign them to certain variables. Chapter six and Chapter seven_presents the discussion which combines the theoretical background presented in Chapter three with the empirical

observations in Chapter five in order to answer the research questions of the study. It aims to answer the questions of ‘why’ and ‘how’ that was presented in the introduction. Chapter eight finally provides the overall conclusions of the study and the recommendations.

2 Cities versus Agriculture: Setting the Study Context of Hyderabad (India)

Overview

This chapter opens with a global review of 'urbanization versus agriculture' and taking Hyderabad as a typical example, an overview of the two competing sectors underlining the 'competition-conflict-reallocation' nexus is presented. It elaborates the increasing urbanization of Hyderabad and its growing demand for water which subsequently puts pressure for competition of water with the agricultural sector. The timeline of the Hyderabad water issue is thereafter chronicled to set the historical and political context of the study. The current water status of Hyderabad's water provision is described. It also systematically charts the historical account of the shift of customary water rights to the Indian state. It then explains the provision of water rights in India in the current context. Describing the water provision in the Indian Constitution helps us to construct the water jurisdictions for both irrigation and urban drinking water sectors and the water-related actors at the central level and the state level in Andhra Pradesh. This chapter finally throws some light on the concept of property rights and categorizes the institutional arrangements for water allocation and the types of water transfers under which Hyderabad fall.

2.1 Cities vs. Agriculture: A Global Review

With increasing urbanization, the domestic water demand is being met by sources that generally have pre-existing agricultural uses and such transfers are made at the cost of reducing the agricultural share (Abernethy, 2003: 59). Urbanization is a universal phenomenon resulting from a gradual shift from agriculture to industry and modern services (Pholo Bala, 2009: 2). As a result of urbanization, water requirements and henceforth competition with the agricultural sector is projected to be more prevalent in Asia and Africa. The demographic trend of urbanization indicates that by the 1990s, Europe, The Americas, and Oceania were urbanized over 70 percent; while Asia and Africa were only 34 percent urban. However, it is also projected that as much as 95 percent of these increases in urbanization will occur in developing countries, especially in Asia and Africa (Catley-Carlson, 1988: 184). According to the World Urbanization Prospects-The 2011 Revision

(Heilig, 2012: 1), 50 percent urbanization rate will be attained by 2020 in Asia, whilst Africa will catch up by 2035. Mohan et al. (2011: 1274) argue that the current pattern of rapid urbanization has major repercussions on increasing additional demand on natural resources, particularly on land use, energy, and water consumption, thereby exerting significant pressure on the environment. Whilst the sectoral water demand indicates that agriculture continues to take up the largest share of water accounting for an estimated 72 percent of water withdrawals (Meinzen-Dick and Appasamy, 2002: 28), however, with increasing urbanization, the domestic and industrial demands are growing much faster, especially in the developing countries (Meinzen-Dick and Ringler, 2008; Molle and Berkoff, 2006; Rosegrant and Ringler, 1999). There is evidence of emerging trend of cities competing for water as a result of urbanization in water-scarce river basins in Asia (Van Rooijen et al., 2005: 81). India and China, perhaps the two most important country representative of the problem in this decade shows an interesting trend. The urban water demand in China is projected to grow 60 percent while the industrial water demand will increase 62 percent over the next ten years (Nyberg and Rozelle, 1999: 85). According to the World Bank (1998), the domestic and industrial water withdrawals in India will double over the next 25 years, accounting for 27 percent of total withdrawals for the country by 2025, compared to 17 percent in the mid-1990s. As a result of the increase in urban water demands occurring at a much quicker pace especially in the developing countries, there has been an increasing trend to re-appropriate water from other sectors; generally agriculture. With the perception of domestic and industrial use having a higher value than agriculture, the requirement of inevitably transferring water out of the agricultural sector is a growing phenomenon (Molle and Berkoff, 2006; Rosegrant and Ringler, 1999). Meinzen-Dick and Appasamy (2002: 39) pointed out, how such water urban transfers from the agricultural sector prevailed because of the perception of higher value in the non-agricultural sector. Therefore, they reiterated not to undermine the importance of irrigation in agriculture, as irrigation played a huge role towards food security and rural livelihoods. For instance, in India, 55 percent of agricultural output is from irrigated land (Singh et al., 2013).

Numerous studies on effects in agriculture as a result of such urban water transfers have been studied, particularly in China (Cai, 2008; Huang, Rozelle, Lohmar, Huang, and Wang, 2006; Jiang, Luo, Peng, Wang, and Jiao, 2012; Zhou, Zhang, Abbaspour, Mosler, and Yang, 2009)

and various countries around the world such as Tanzania (Kashaigili, Kadigi, Sokile, and Mahoo, 2003), South Africa (Farolfi and Perret, 2002; Juana, Kirsten, and Strzepek, 2006), Nepal (Bhattarai, Pant, and Molden, 2005), Philippines (Pascua, 2007) and Cyprus (Ansink and Marchiori, 2010). Molle and Berkoff (2006) reviewed a number of cities worldwide which increased their water supply from the agricultural sources. They concluded that, despite the critical importance to rural livelihood, transfers of water out of agriculture have always and will continue to prevail, giving rise to such inter-sectoral competition and conflicts.

2.2 Hyderabad Case Study: 'Competition-Conflict-Reallocation' Nexus

Hyderabad, the capital of Andhra Pradesh is a typical example of a city entrenched in the inter-sectoral water competition and conflicts. An emerging megacity of importance, it is the fifth largest city in India and also continues to be the fastest growing city. Rapid urbanization and population growth have been manifested as a result of hugely successful economic reforms initiated by the government promoting investments, both foreign and national (Kennedy, 2007). This has eventually increased the water demand of the city manifold. Celio and Giordano (2007) has articulated how Hyderabad over the years began withdrawing water from pre-existing agricultural sources to meet the city's demand despite vehement opposition from the agricultural sector. With a high degree of livelihood dependence on water by the pre-existing agricultural users, it eventually started off the conflicts between the rural and urban sectors, as we see in the present day.

According to Narain (2006), Hyderabad is hydrologically a severely water-constrained city. The city's inability to meet the growing water demand despite drawing water from the agricultural sources amidst fierce opposition, therefore makes a valid case to examine the inter-sectoral competition and conflict of water resources in the rural-urban context. Chawla et al. (2012) reviewed the priorities and challenges in the inter-sectoral water allocation of water in India. He noted that the National Water Policy indicated priorities in water allocation to different sectors. However, it failed to explicitly address the mechanisms to handle the competing demand among different sectors. Though some mechanisms have evolved to resolve inter-state water disputes, however to date, there is none to appreciate and address such emerging inter-sectoral conflicts.

The population of Hyderabad was estimated at around 5.7 million in 2001 (Kundu et al., 2005). According to Mekala et al. (2009), the city had an estimated population of approximately 7 million, which has seen an average growth rate of 8.73 percent per year (Government of Andhra Pradesh and Centre for Economic and Social Studies, 2008). Hyderabad's population is expected to reach an estimated 9.3 million by 2016 (Table 2-4). The economic growth was pegged at an average rate of 8.73 percent per year between 2007-2008 (Government of Andhra Pradesh and Centre for Economic and Social Studies, 2008). This rapid pace of economic development with the increasing city population eventually increased its water demand as well. Reckien et al. (2011: 12) stated that the provision of an adequate amount of safe water has not been able to keep up with the continuing growth rate of the city. For instance, the supply intervals of drinking water have declined over the years, from 19 hours per day in the early 1980s to 1.5 hours per day in the 2000s. Shortages in the city water supply coupled with the drying up of reservoirs along with the steady decline in groundwater show that the future of Hyderabad's water problems continues to be bleak.

According to Celio and Giordano (2007), Hyderabad began withdrawing water from pre-existing agricultural sources to cater to the city's increasing demand. Over the years water from the two major sources of Rivers; Manjira (a tributary of River Godavari), and Krishna have been administratively allocated to Hyderabad. The transfer of Manjira water to Hyderabad from the Singur reservoir (also catering to the Ghaaranpur irrigation project and Nizamsagar irrigation project) was administratively sanctioned via Government Orders (G.Os). It may be noted that the G.O. gave priority to drinking water for Hyderabad, where it clearly stated that water would not be allocated to the agricultural sector, and be reserved only for Hyderabad's drinking needs if the water level in the reservoir fell below a prescribed level. However, over the years it has been recorded that water was released to the agricultural sector to both Ghanpur and Nizamsagar irrigation projects, even though the water levels in Singur reservoir fell below the minimum prescribed level in the G.O. From the data available, Celio and Giordano (2007) suggested that a number of such arbitrary reallocations of water to the agricultural sector over the years seem to have been determined by various factors. Those factors under which such arbitrary reallocations persisted typically were political pressures on the State government or by public representatives of farmers in both the Nizamsagar and Ghanpur command area. Also, there is strong evidence of electoral politics influencing such

arbitrary water reallocations, where water released to farmers in the agricultural sector has preceded key electoral milestones in some instances.

The situation accounted by Ali (2013), is a typical representation of the inter-sectoral conflicts which has been unfolding over the last twenty years since water has been brought to the city from Manjira River and Krishna River originally meant only for agricultural purpose. In the year 2013, due to poor monsoon, the five sources supplying water to the city declined. Osman Sagar and Himayat Sagar dwindled to cause a deficiency of 40 million gallons of water per day, as against the required supply of 120 Million Gallons Per Day (MGD). The water level in Singur reservoir across Manjira River supplying a large proportion of drinking water to city and irrigation water for agriculture severely declined as well. The Andhra Pradesh government was left in a dilemma; whether to reduce the supply of drinking water to the city or reduce water for irrigation to the two irrigation projects; Ghanpur irrigation project in Medak District and Nizamsagar irrigation project in Nizamabad District. It may be interesting to note that reducing water for irrigation would have a negative impact on the ruling political party, as the government was under huge pressure from the farmers, supported by their local Ministers, Members of the Legislative Assembly (MLA) and Members of Parliament (MP) from Medak and Nizamabad districts. The Singur dam with a total capacity of 30 Thousand Million Cubic Feet (TMC) was down to 9.608 TMC in its reservoir, which was already two feet below the prescribed limit set by the government. The set condition was; if the water level falls below the prescribed limit, water was to be stored solely for Hyderabad's drinking water needs and not be released for irrigation. Even if the farmers were given as little as 3 TMC of water as against their demand of 5 TMC, the city would have still had to bear the brunt. The city needed nearly 6 TMC of water at the rate of 0.9 TMC per month for up to five months, to continue the prevailing supply of 120 MGD per day. However, there has been a trend of water being re-allocated to the agricultural sector against the administratively prescribed allocation guidelines, over the years. Henceforth, this study seeks to examine the institutional context of the water allocation mechanism in place and underlying process of the interplay of water-related actors and rules and the dynamics of various factors which eventually propagates such arbitrary water reallocations that have detrimental consequences for both the sectors.

2.3 Historical and Political Perspective of Hyderabad's Water Issue

In the year 1908, there was flooding of the Musi River, a tributary of Krishna River flowing through Hyderabad. As a result, two reservoirs were constructed to serve as flood protection measures as well to provide drinking water for Hyderabad. Osman Sagar reservoir was created by damming the Musi River in 1920, followed by Himayat Sagar reservoir in 1927. Hyderabad water works were restructured in 1930 which included Osman Sagar and Himayat Sagar into the Hyderabad Water system, sufficiently supplying about 35 Million Cubic Meter per year (MCM/year) to the city until the 1950s. However, as population increased with economic development, there was the need to seek for new water sources. In 1947, with India gaining independence, the Indian government appointed the Reorganization Commission in 1953 where Andhra Pradesh was formed by bringing together coastal Andhra which was relatively economically well off and Rayalseema which was drought prone and relatively ill-developed (Government of India, 1955). Finally, on the 1st of November 1956, Andhra Pradesh was formed, where the "Gentlemen's Agreement" was signed by the leaders of Telangana and the Andhra state. This agreement was essentially meant to safeguard the interest and economic development of Telangana. In 1956, the state formed the constitution where the political scene in Andhra Pradesh was dominated by the Congress Party.

However, in the year 1969, the first agitation for a separate Telangana state ensued due to regional disparities and the non-respect of the provisions of the Gentlemen's Agreement. This was followed by the second agitation in 1973 for bifurcation of the state. The key reason of agitation was over the disparity of ac-cess to water and irrigation facilities between the three regions; amongst other factors (Begari, 2009). There have been long-standing perceived inter-regional economic disparities, coupled with the politicization of regional identities which have affected politics in the state within the realms of contestation of economic resources such as water, amongst other (Suri, 2002). With the gradual urban growth in Andhra Pradesh, it eventually resulted in the increasing gap between water demand and supply. In the 1960s, plans were proposed to convey water from Manjira River, a tributary of Godavari to Hyderabad which was approximately 60 km north-west of the city. In 1965 the Manjira project was completed to convey 26.5 MCM/year of water to the city. In 1972, with further urbanization and the increasing need for water, the Government of Andhra Pradesh appointed the Sreenivasa Rao Expert Commission to recommend options for augmenting the Hyderabad

water supply. The Commission recommended groundwater to be inappropriate since it was scarce and pollution-prone. The Commission also argued that the Manjira River was already largely committed to agricultural uses, and the option of bringing water from the Godavari River was eliminated based on high costs. In 1973, the Commission, therefore, suggested conducting further investigations for drawing water from the Krishna River (Government of Andhra Pradesh, 1973), which was however rejected.

It is vital to note that the two major Rivers of Andhra Pradesh, Godavari and Krishna flow through three Indian states (Andhra Pradesh, Maharashtra and Karnataka), causing inter-state water disputes. Therefore in 1969, the Government of India constituted the Godavari Water Disputes Tribunal (GWDT) as well as the Krishna Water Disputes Tribunal (KWDT). In 1988, the Godavari Water Disputes Bachawat Tribunal Award allocated 60 TMC of Manjira water to Maharashtra and 65 TMC to Andhra Pradesh, which was to be specifically allocated to Nizamabad and Medak districts. Complying with the agreements of the award, the Singur reservoir was constructed with a storage capacity of 850 Million Cubic Metres (Mm3) across the Manjira. The reservoir was completed in two phases; one in 1991 and one in 1993 (Government of Andhra Pradesh, 2005). The reservoir came into operation in 1991 with the allocation of water for both urban (Hyderabad) and agricultural (Ghanpur and Nizamsagar irrigation projects) sectors with allocation rules issued by the Government in 1989. The Government Order specified Hyderabad's entitlement to 197 Mm3 of water annually; while 352 Mm3 was allocated to Ghanpur and Nizamsagar irrigation projects. It is interesting to note that the 1990 G.O. indicated the priority for water supply to Hyderabad by specifying conditions to the operation rules of the Singur reservoir. There was a prescribed minimum water level at the reservoir, below which water was to be solely reserved for Hyderabad's drinking water and not to be released to the agricultural sector. The specified minimum levels were set to ensure that water stored in the Singur reservoir would always remain sufficient to cater to the water needs of Hyderabad (Celio and Giordano, 2007). The Singur reservoir was the main water source for the city of Hyderabad until the onset of the Krishna Water Supply Project in 2004.

In 1982, the Telugu Desam Party (TDP) came to power ending the dominance of the Congress party for three decades and went on to retain power until 1989. While the TDP was still in power, the Government of Andhra Pradesh in 1998 issued a Government Order to sanction the

supply of water from Krishna River to Hyderabad, which was initiated in 1986 by the Sri J. Raja Rao Expert Commission. This Commission was appointed by the government of India to submit a range of technically and economically sound alternatives for further augmenting water supply to Hyderabad. The Commission in its report recommended drawing the required 467 Mm3 of water annually from the Nagarjuna Sagar reservoir of the Krishna basin. Drawing out water as recommended by the mission meant having to reallocate water out of the agricultural sector. However, the Commission justified the priority to be given on drinking water over irrigation, based on the report of the India Irrigation Commission (Government of India, 1972). In addition, the award of the Krishna River Disputes Tribunal of 1976 allocated 75 percent dependable flow of the Krishna River as follows; 15.8 Billion cubic meters per year (Bcm/yr) to Maharashtra, 19.8 Bcm/yr to Karna-taka and 22.6 Bcm/yr to Andhra Pradesh (Government of India – Krishna Water Disputes Tribunal, 1976). The Commission further asserted that priority of water supply to Hyderabad was also justified because people belonging to all the districts in the state inhabited in the capital city of Hyderabad (Government of Andhra Pradesh, 1987). This decision was staunchly objected by legislators of the Indian National Congress from the Rayalseema region, by organizing sit-ins and hunger strikes in the State Legislative Assembly. The contention was to first bring water to Rayalaseema before conveying water to Hyderabad as per the Krishna Waters Dispute Tribunal and the specifications of the Sri Bagh Pact of 1937 1 (Government of Andhra Pradesh, 1988). The legislators from the Rayaleema region, which is predominantly a dry region of Andhra Pradesh, argued that it would be most affected by Hyderabad's water transfer from the Krishna River (Deccan Chronicle, 1988). This protest also highlighted the links of water supply to Hyderabad that is ingrained into the wider context of regional issues.

In 1990 the Congress came back into power and the government under the Congress rule appointed another expert commission. The commission's recommendation led the government to sanction the withdrawal of 467 Mm3 annually from the Nagarjuna Sagar reservoir across the Krishna River (D'souza, 2006). But the following years until 1994, the government under the rule of the Congress party was politically unstable, due to which the project to supply water from Krishna almost did not progress beyond the laying of the foundation stone. In 1994, the TDP was voted back into power. With the increase in demand for water in Hyderabad, the TDP Government in 1996 decided to draw water from Krishna River near

Nagarjuna Sagar dam which was about 120 km away from Hyderabad. Eventually in 1997, water withdrawal from the Krishna was sanctioned through various Government Orders (G.O.), and finally, in 2002 and 2003, the implementation and execution of the Krishna Drinking Water Project were undertaken (Celio, Scott, and Giordano, 2010). In 2004 the Krishna Water Supply Project Phase-I was finally commissioned to supply water to Hyderabad drawing 75 MCM/year. In the year 2005, water was finally diverted from the from the Akkampalli Balancing reservoir of the Krishna Water Supply Project Phase-I, despite strong opposition from the farmers.It is interesting to note that the waters of Krishna finally reached Hyderabad only in the year 2005. It took thirty-two years after the submission of the report of the Sreenivasa Rao Expert Committee in 1972 (Celio and Giordano, 2007: 11). This was attributed mainly due to the prolonged and non-consensus decision-making process on water reallocation from the Krishna River. The reason behind the contention of the water transfer was because of the vehement opposition by the legislators from Rayalaseema region whose constituencies were mostly affected as a result of such water transfers to Hyderabad. Hence this section clearly highlights and charts how the regional considerations strongly underlined the politicization of the process of augmenting Hyderabad water supply over the years.

2.4 Provision of Drinking Water for Hyderabad

The Hyderabad Metropolitan Water Supply and Sewerage Board (HMWSSB from hereon) was constituted on the 1st of November, 1989. The Board is an ‘autonomous’ body under the Hyderabad Metropolitan Water Supply and Sewerage Act, 1989. It was created to give administrative and financial independence and increased responsibility while supplying drinking water to the people. It is the statutory authority in charge of providing and maintaining water supply and sewerage facilities in Hyderabad and the surrounding municipalities. The HMWSSB has a mandate to plan, design, construct, organize, execute and manage water supply systems in the city. The water supply service area covered by HMWSSB (Fig 2-1) is 688.2 Square Kilometres (Sq.Kms), including Municipal Corporation of Hyderabad (MCH) area covering 169.3 sq.kms, the ten adjoining Municipalities covering 377 Sq.Kms, Secunderabad Cantonment and the University of Osmania Campus covering 44.1

Sq.Kms, the 10 en route villages covering 97.8 Sq.Kms and finally the two new municipalities of Patancheru and Ramchandrapuram.

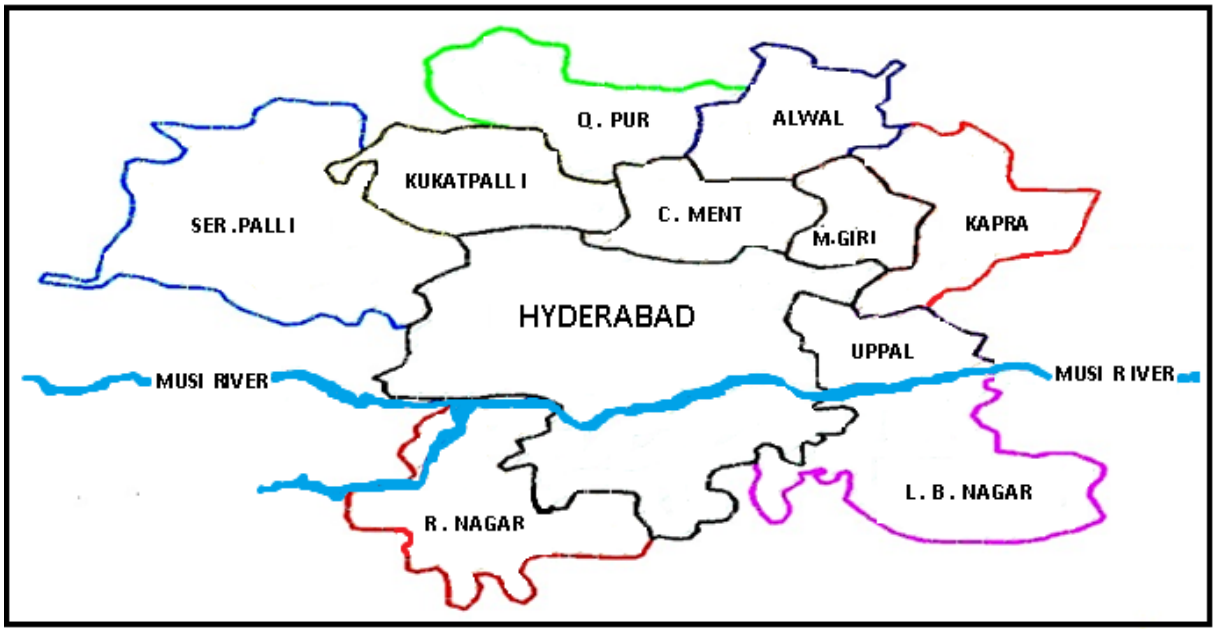

Figure 2-1: Hyderabad Metropolitan Water Supply and Sewerage Board (HMWSSB) Service Area covering Hyderabad

Source: Hyderabad Metropolitan Water Supply and Sewerage Board (2008)

It is reported that the water service covers 95 percent of the city's population with up to 90 percent in the slum areas (GHMC, 2006; Water and Sanitation Program, 2008). However, water access is very poor and intermittent with water being supplied for a few hours on alternate days, or twice a week especially in the low-income areas (George et al., 2009; McKenzie and Ray, 2009). The main surface source of water for the city of Hyderabad is from five impoundments of the following four Rivers (Table 2-1): Musi, Esi, Manjira and Krishna, out of which sources from Musi and Esi, i.e. Osman Sagar and Himayat Sagar were originally constructed to cater drinking water for Hyderabad, as it is today (Figure 2-2). Manjira and Krishna sources were originally meant for the agricultural purpose, but water has been diverted over the years to the city to cater to its increasing demand as a result of rampant urbanization.

Table 2-1: Characteristics of the Four Surface Source of Water

Source	River	Year	Impoundment	Distance from city	Drawls MGD
Osmansagar	Musi	1920	Osmansagar	15.0	15.0
Himayatsagar	Esi	1927	Himayatsagar	9.6	15.0
Manjira Phase I	Manjira	1965	Manjira Barrage	58.0	15.0
Manjira Phase II	Manjira	1981	Manjira Barrage	59.0	30.0
Manjira Phase III	Manjira	1991	Singur Dam	80.0	40.0
Manjira Phase IV	Manjira	1993	Singur Dam	80.0	45.0
Krishna Phase I	Krishna	2004	Nag.Sagar Dam	116.0	90.0
Krishna Phase II	Krishna	2008	Nag.Sagar Dam	116.0	90.0
Total					340.0

Source: Ramachandraiah and Vedakumar (2007: 2)

The current demand of the city's water needs is 450 MGD (Million Gallons Litre per /Day). However, the Hyderabad Metropolitan Water Supply and Sewerage Board supplied only 340 MGD from its five sources of water (Table 2-1) to different categories of users. Projections of water demand and deficit in Hyderabad (in MGD) against the population in the coming years indicated a growing gap between the demand and the deficit (Table 2-2). The domestic users (including the slums) accounted for almost 96 percent, while commercial and industrial users account for just 3 percent (Table 2-3), with an abysmal supply of water on alternate days in the city and once in five days in surrounding municipal circles.

Table 2-2: Current Water Demand-Supply of Hyderabad

Municipal area of Hyderabad	707 sq km
Total area (Hyderabad Metropolitan Area)	1,905 sq km
Population (2005)	7.0 Million
Population (2011) as projected in 2005-06	8.2 Million
Water sourced from surface sources	88 percent
Water sourced from groundwater	12 percent
Population served by water supply system	70 percent
Current population (2012)	9 Million approx.
Current water demand (2012)	460 MGD
Current water supply (2012)	340 MGD
Current deficit (2012)	187 MGD

Source: Centre for Science and Environment (2011)

Table 2-3: Water Users of Hyderabad

Category	Connection	Percentage
Domestic	387,532	77.38
Slums	98,696	19.71
Commercial	13,451	2.69
Industrial	936	0.19
Others	194	0.04
Total	500,809	100.00

Source: Centre for Science and Environment (2011)

Table 2-4: Projections of Water Demand and Deficit in Hyderabad (in Million Gallons per Day)

Years	2001	2006	2011	2016	2021
Population (Million)	5.50	6.74	7.72	9.30	10.90
Supply	153.00	162.00	162.00	162.00	162.00
Demand	230.00	290.00	328.00	360.00	400.00
Deficit	77.00	128.00	166.00	198.00	238.00

Source: Hyderabad Metropolitan Water Supply and Sewerage Board (2012)

With the current projection of the water demand and supply, the future seems to be bleak (Table 2-4). Furthermore, in the process of transferring long-distance water to the city, at least one-third of the water is lost during distribution and livery (Van Rooijen et al., 2005: 86). In addition, innovative ideas such as rain-water harvesting approaches to augment water supply, allocation and distribution in the city have not received due attention even though there is huge potential for rainwater harvesting (Narain, 2006: 4). George et al. (2009: 295) stated that with the amount of average rainfall that Hyderabad receives annually, about 80,000 litres of water can be comfortably generated from a 100 square meter roof area. As a result, a close average of 40 million cubic meters of water from the rooftop and rainwater tanks in the city could potentially meet about 35 percent of the domestic demand each year (Nastar, 2014: 57). However, not much attention has been paid to water reforms and policies in the area of rainwater harvesting technology due to pressure mostly from real estate lobbies and lack of governmental incentives (Narain, 2006: 8). For instance, under the urban renewal plans in Hyderabad, Nastar (2014: 57) noted that rainwater harvesting has been made an optional non-mandatory reform. Additionally, the government has withdrawn the 50 percent subsidy on Hyderabad rainwater harvesting "Neeru-Meeru" initiative (HMWSSB, 2008; JNNURM, 2011).

The following section gives a brief account of the current water augmentation projects that have been taken up and is underway. Additional water from Phase-I of Godavari and Phase-III of Krishna have been planned, after taking into ac-count the predicted water requirements of the city up to 2017 (Ali, 2012). The Godavari Drinking Water Supply Project Phase-I was intended to bring 180 million gallons of water a day to the city. As of May 2012, to complete the Rupees 3,375 crore project, the HMWSSB had mortgaged its properties to avail a loan of Rupees 2,000 crore from HUDCO (Housing and Urban Development Corporation) a government of India undertaking. The State government had sanctioned Rupees 1,400 crore, with an additional amount of Rupees 400 crore in the following financial year. As of June 2013 (Ifthekar, 2013), the much-awaited forest clearance for the Godavari Drinking Water Supply Project Phase-I was cleared. In the case of Krishna Drinking water Augmentation Project Phase-III, as of April 2012, in order to complete the Rupees 1,670 crore project, the State government sanctioned a meagre Rupees 30 crore as against the original demand of Rupees 1,660. This meagre sanction was in view to reduce dependency on Krishna water due to the recent award of the tribunal on sharing of the River water between Andhra Pradesh and Karnataka. However, by May 2012, the state government approved the HMWSSB's loan proposal from HUDCO a sum of Rupees 1,670 crore for the Krishna Drinking water Augmentation Project Phase-III to meet the water needs of the Greater Hyderabad Municipal Corporation (GHMC) area. As of January 2013, it was stated that the government was committed to complete the third phase of the Krishna water supply to the state capital within 18 months (Times of India Jan 27, 2013). The water requirement projected as against the pace of current water augmentation projects underway clearly indicated that water scarcity will continue to prevail. Under such water-stressed condition, competition and conflicts are predicted to continue to persist across all sectors.

Saleth and Dinar (1997: 11) identified the pattern of water conveyance to Hyderabad since 1922 that closely corresponded to the figures in Table 2-1. They noted that the time gap of drinking water projects undertaken had decreased, indicating the obvious increase in water demand. In addition, the distance between each successive drinking water project has moved further away from Hyderabad. This has not only increased the costs but has also resulted in massive transmission and distribution losses. In this regard, George et al. (2009: 694) noted the average cost of water previously brought to the city from Osman Sagar and Himayat

Sagar which was just 15 km away from Hyderabad. However, the cost increased five folds as water was brought from Krishna and Godavari Rivers which is almost 120 km away from Hyderabad. This pattern according to Saleth and Dinar (2001: 122), not only had major repercussion on costs as well as transmission and distribution loss of water but having to divert water from sources with existing multiple users have engendered inter-sectoral water conflicts over the years. Concerning groundwater sources and its share of supplying to the city, the Hyderabad Metropolitan Water Supply and Sewerage Board (1995b: 5) reported that it met only as much as 6 percent of the total demand, which was mostly distributed by private entities.

2.5 Shift of Customary Water Rights to the Indian State

In order to investigate the key research question as to why an arbitrary reallocation of water persists, this section systematically charts the historical account of the shift of customary water rights to the Indian state. Cullet and Gupta (2009: 159) documented the fragmentation of water law, which is well known to be both a state subject as well as at the Union level where the elements of water laws are embedded in health or environment laws. This is further coupled with a complex administrative arrangement with often overlapping or contradicting rights and responsibilities. Siddiqui (2008: 577) succinctly gave an interesting account on customary rights over water in India and its evolution, which were influenced by physical and climatic conditions and evolving technological development.

With colonialism and formation of a welfare state, there was a gradual shift of power relations; eventually diminishing these customary rights over water resources. Tracing back the historical account of customary rights, there were two tiers of management which were defined on caste and hereditary basis. The higher caste was responsible for regulating and enforcing rules of water resource management assuming a supervisory role. The other was involved in construction and other hard labour. Whilst there were no codified rules, there were well-laid informal rules and regulations to undertake various aspect of water resource management such as water sharing, and the penalty for not participating in the management of water resources including dispute resolution. However, according to Majumdar et al. (1948), it was the British who introduced the concept of government control over surface waters.

Until the revolution of 1857, the customs and local rules were only intervened where it clashed with their interest and laws such as the Charter Act of 1833 was enacted to codify the laws in India. It was only after the revolution of 1857 when the British began to exercise its power and control.

After Independence post-1947, the Irrigation Bill of 1953 secured the control of water resources by the state, thereby curtailing the customary rights. These rights were further curtailed with industrialization allowing more rights to the state to bring more irrigation command and growing cities under their control (Siddiqui, 2008: 577). Eventually, the Northern India Canal and Drainage Act (1873) was put into place. This Act which recognized the right of the Government to "use and control for public purposes the water of all Rivers and streams flowing in natural channels, and of all lakes" was a landmark towards strengthening of state control over the surface water of the state (Majumdar et al., 1948). Siddiqui (2008: 577) further pointed out the characteristics of water law in India being associated with land, pushed farmers into further depth of insecurity as almost 80 percent do not own land. It may be noted that the existing legal and institutional framework for water laws in India are embodied in the National Legislations such as the Water Prevention and Control of Pollution Act 1974; Air Prevention and Control of Pollution Act 1977; Environment Protection Act 1986; Forest Conservation Act 1988 and the Environment Assessment Development of Projects, 1994. The nodal agency which acts as the administrative entity of the central government is the Ministry of Environment and Forest.

2.6 Types of Water Rights in India

The previous section charted the historical account of the shift of customary water rights to the Indian state. This section describes the provision of water rights in India in the current context. Abernethy (2005) explained that the foundation to carry out the institutional analysis of water governance lie in tracing the basis in which access to water is controlled and influenced by social institutions. Institutions are essentially rules of the game that structure access to water when competition over water increases, as a result of which interactions occurs between water-related actors. These water-related actors may have few other common concerns beyond sharing an increasingly contested resource. It is, therefore, important to look

beyond the conventional analysis of water rights and not just formal water rights supported and derived by government law books and regulatory agencies. In other words, beyond formal water rights, it is important to further delve into other types of water rights that exist in practice informally, such as a range of different negotiation arenas through which different stakeholders in water management may seek to increase, defend, or otherwise influence their access to water. For instance, by negotiating disputes, approaching bureaucratic agencies, court appeals, or lobbying for a change in legislation (Bruns and Meinzen-Dick, 2005: 4).

In order to understand the formal institutions that structure access to water, it is vital to examine the concept and development of water rights and different types of water rights relating to property rights. Issues relating to ownership of water are not only a complex one but also different compared to other resources. The use, control and ownership of water are linked to the ownership of land and irrigation structures. Thus water ownership cannot be discussed in isolation. While the common concept associated with property rights refers to ownership to a particular resource with the permission to be able to do anything with it, it is, however, more important to also consider and examine what bundles of rights may different parties hold (Bruns and Meinzen-Dick, 2003: 4). These bundles of rights according to Schlager and Ostrom (1992: 250-251) are classified as access and withdrawal, management, exclusion and alienation rights.

Table 2-5: Water Rights in India

Types of Perspectives	Right Holders	Applicability and Remarks	Examples
Riparian	Rights to waters of flowing River inherited-in, or claimed by, different users located alongside that River	At levels of households, farms, communities, villages and towns. It occurs in a more marked form at the level of political or administrative units within or with another country	Inter-state Cauvery dispute, Indus Treaty 1960 (India-Pakistan)
Federalist	Distribution of rights and powers to water between different levels in the federal structure	Three list-Union, State and Concurrent. A distribution of legislative power of the Union Parliament and State Legislatures	Water is listed as state subject in the constitution
Formal Law	Includes judicial	The right to drinking water is a	

	determination	fundamental right	
Customary Law	Communities allocate water according to land ownership, caste or community membership	Farmers managed irrigation systems, domestic water supply not built by government	Small tanks in South India, Kuhls in Himalayas, wells
Civil Society	Individuals/Organization	Arises in three different but inter-connected contexts where local communities are involved	Anna Hazare's movement in Maharashtra

Source: Raju and Sarma (2004: 3)

These rights are use rights (for access and withdrawal), control or decision-making rights (to manage the resource, exclude others from it, and to alienate, or transfer) and finally rights to the resource to others (von Benda-Beckmann, 1995: 224). Depending on the types of perspectives, the question of rights relating to water in India has been succinctly elaborated by Raju and Sarma (2004: 3) in the above Table 2-5.

2.7 Water in the Indian Constitution

This section describes 'Water' in the Indian Constitution which maps out and further constructs the study context relating to water jurisdictions (for both irrigation and urban drinking water sectors) and water-related actors at both the central level as well as the state level in Andhra Pradesh. Mishra (2015: 2) accounts the complexity of power, roles and responsibilities embodied in the constitutional and legislative framework of the water rights regime in India. The Constitution of India lays down the legislative and functional jurisdiction of the Union, State and local Governments regarding 'Water'. Therefore, the constitutional provisions in respect of allocation of responsibilities between the State and Centre fall into three categories: The Union List (List-I), the State List (List-II) and the Concurrent List (List-III). However, most of the Rivers in the country are inter-state and the regulation and development of waters of these Rivers is a constant source of inter-state disputes.

Therefore whilst 'Water' is basically a State subject, the Union comes in only in the case of inter-state River waters. In such case of inter-state water, which states have jurisdiction over

such water is prescribed in List II (i.e. the State List) of the Seventh Schedule. It has the following as Entry 17: "Water, that is to say, water supplies, irrigation and canals, drainage and embankments, water storage and water power subject to the provisions of Entry 56 of List I". Entry 56 of List I (Union list) reads as follows: "Regulation and development of inter- state Rivers and River valleys to the extent to which such regulation and development under the control of the Union, is declared by Parliament by law to be expedient in the public interest".

In case of disputes relating to inter-state waters, the Constitution has a specific article (Article 262), dealing with adjudication of disputes relating to matters of inter-state Rivers or River valleys, which reads as follows: “(1) Parliament may by law provide for the adjudication of any dispute or complaint with respect to the use, distribution or control of the waters of, or in, any inter-state River or River Valley. (2) Notwithstanding anything in this Constitution, Parliament may, by law provide that neither the Supreme Court nor any other court shall exercise jurisdiction in respect of any such dispute or complaint as is referred to in Clause (1)”. Under the Article 262, the Parliament enacted the Inter-State Water Disputes Act of 1956, under which a number of tribunals have been set up to resolve water disputes among the states. Article 262 grants Parliament the right to legislate over the matters in Entry 56, superseding the Supreme Court (Richards and Singh, 2002: 613). The Environment (Protection) Act, 1996, and notifications issued under it by the Union Ministry of Environment and Forests (MoEF), require all states to get central clearance for major water projects. When two or more states with the approval of their respective assemblies want to adopt uniform water legislation, they can request the Union government to provide such legislation. However, subject to the above limitations, and limitations enforced by central administrative, (i.e. limitations laid down by Parliament), the power and authority to define laws pertaining to water resources in a particular state lie in its respective government (Mishra, 2015: 2).

Hence, the two laws enacted by the Union under Article 262 and Entry 56 of List I are the Inter-State Water Disputes Act, 1956 (as amended up to 1980) and the River Boards Act, 1956. The recent 1992 amendments to the Constitution regarding Panchayats and Municipalities introduced the following entries in the schedules. It listed the subject areas in which the State Governments and legislatures may devolve functions to such bodies, so as to make them evolve as local self-governing institutions. In the Eighth Schedule (Part IX)

dealing with Panchayats, the subjects, "Minor irrigation, Water management and Watershed development", "drinking water" and "maintenance of community assets" are listed. In the Twelfth Schedule (Part IX A) dealing with municipalities, the subjects "water supply of domestic, industrial and commercial purposes" is listed. Therefore, there are also provisions in the Constitution for local Government's responsibilities in respect of several aspects of water use.

In the study context, Celio and Giordano (2007: 233) pointed that the State imposed absolute rights over surface waters. Therefore the state government designated different departments to administer different sectors. Because of the provision of the State's rights over surface water, there were provisions for the government of Andhra Pradesh to reallocate water through bureaucratic means. However, the States' rights over surface waters are restrained in the case of inter-state Rivers whose waters are disputed between some or all of their riparian states. In such cases, under the provision of Article 262 of the Constitution, the central parliament can provide for the adjudication of the inter-state dispute of water. Hence, the Inter-State Water Disputes Act (1956) laid down under Article 262 gives the provision to the Central Government to refer the matter to a tribunal for settling disputes between states (Iyer, 2003).

In this regard, Celio and Giordano (2007: 232) concisely charted the River disputes in the study context. The two major Rivers of Andhra Pradesh; Godavari and Krishna flow through three Indian states (Andhra Pradesh, Maharashtra and Karnataka) causing inter-state water disputes. Therefore, in 1969 the Government of India constituted The Godavari Water Disputes Tribunal (GWDT) as well as the Krishna Water Disputes Tribunal (KWDT). The Manjira River (across which the Singur dam is constructed) originates in the State of Maharashtra and crosses Karnataka to finally enter Andhra Pradesh to eventually join the Godavari River. To plan the sharing of Godavari River between the riparian states, as per the provision of the Indian constitution; Godavari Water Disputes Tribunal was constituted in 1969 and gave its award in 1980 to the three respective states. In this tribunal award, provision of water transfer from the Manjira River to Hyderabad was made. Eventually, in 1988, the Godavari Water Disputes Bachawat Tribunal Award allocated 60 TMC of Manjira water to Maharashtra and Andhra Pradesh was awarded 65 TMC of Manjira water; which was to be specifically allocated to Nizamabad and Medak districts. Complying with the agreements of the award, Singur reservoir was constructed with a storage capacity of 850

Mm3 across the Manjira River in order to supply water to Hyderabad. In the year 1975, Andhra Pradesh signed agreements independently with Karnataka and Maharashtra making provision for Andhra Pradesh to draw 113.3 Mm3 of Manjira water to Hyderabad which was to be drawn via the Singur reservoir. Similarly, in 1976, the Krishna Water Disputes Tribunal (KWDT) allocated 75 percent dependable flow of the Krishna River as follows: 15.8 Bcm/yr to Maharashtra; 19.8 Bcm/yr to Karnataka and 22.6 Bcm/yr to Andhra Pradesh (Government of India-Krishna Water Disputes Tribunal, 1976).

The following section describes the administrative provision of water resources of the Indian state as per the Indian constitution. According to Sahu (2012: 88), India came up with its first ever National Water Policy (NWP) in the year 1987, declaring water as a prime natural resource and a basic human need. In this regard, it accorded drinking water as its highest priority. However, the participation of stakeholders and private sectors were missing, which led to the revision of the policy. Therefore in 2002, a revised National Water Policy was adopted, where different states crafted their own water policies with priorities accorded to drinking water. The provision within the Seventh Schedule of the Constitution of India equipped the Central Government with the River Boards Act-1956 and Inter-state Water Dispute Act-1956. The state governments were given powers to manage and govern the domestic water supply in their respective states. According to Vaidya (2009: 5), the 74th Constitution Amendment Act (CAA) was enacted in 1993 with an aim towards strengthening the urban governance and management of essential services. This Act empowered the urban local bodies to govern and take responsibility for urban water supply. However, it may be noted that the water supply is not solely governed by the urban local body. In addition to the urban local body, there are other agencies (both national and state) which continue to influence its operation and management directly or indirectly.

The Ministry of Urban Development (MUD) takes care of the Urban Water Supply (UWS), under which responsibilities not only include policy formulation and promoting new strategies, setting norms and standards, monitoring but also provide support in form of expertise and finance to state programs. The technical arm of the MUD is the Central Public Health and Environmental Engineering Organization (CPHEEO from hereon) created in 1953. This arm mainly provides advisory services to the Ministry in the area of technical issues. The CPHEEO also works and collaborate with the state agencies on matters and activities

pertaining to water supply and sanitation. Whilst the role of CPHEEO is essentially at the national level, it is the Public Health Engineering Department (PHED) at the state level, responsible for planning and management of water resources mainly through the local government or the municipalities. In some few states such as Andhra Pradesh, Karnataka and Tamil Nadu, the responsibilities are given to the Water Supply and Sewerage Boards. These Water Boards were created to look after supply and management of water in relatively larger metropolitan cities, such as the Hyderabad Metropolitan Water Supply and Sewerage Board (Further discussed in Section 2.9).

Water resource management in India falls under a broad umbrella of different Ministries such as the Ministry of Water Resources (MoWR) and the Ministry of Environment and Forests (MoEF). In addition, various other departments under the MoWR are also involved in some way or the other such as the Central Water Commission (CWC), the Central Ground Water Board (CGWB). The CWC is mainly responsible for regulating surface water use for different sectoral purposes such as irrigation, drinking, electricity and industrial purposes, besides mediating interstate water allocation disputes. The CGWB looks into management and monitoring of groundwater resources. Under the Ministry of Environment and Forests (MoEF), the National Rivers Conservation Directorate (NRCD) takes responsibilities in overseeing plans towards improving the quality of the India's Rivers. Ministry of Agriculture (MoA) is also either directly or indirectly involved while dealing with watershed projects (Sahu 2012: 93). An overall hierarchy of water resource planning on the legislative and functional jurisdiction of the Union, State and local Governments are described in Figure 2-2.

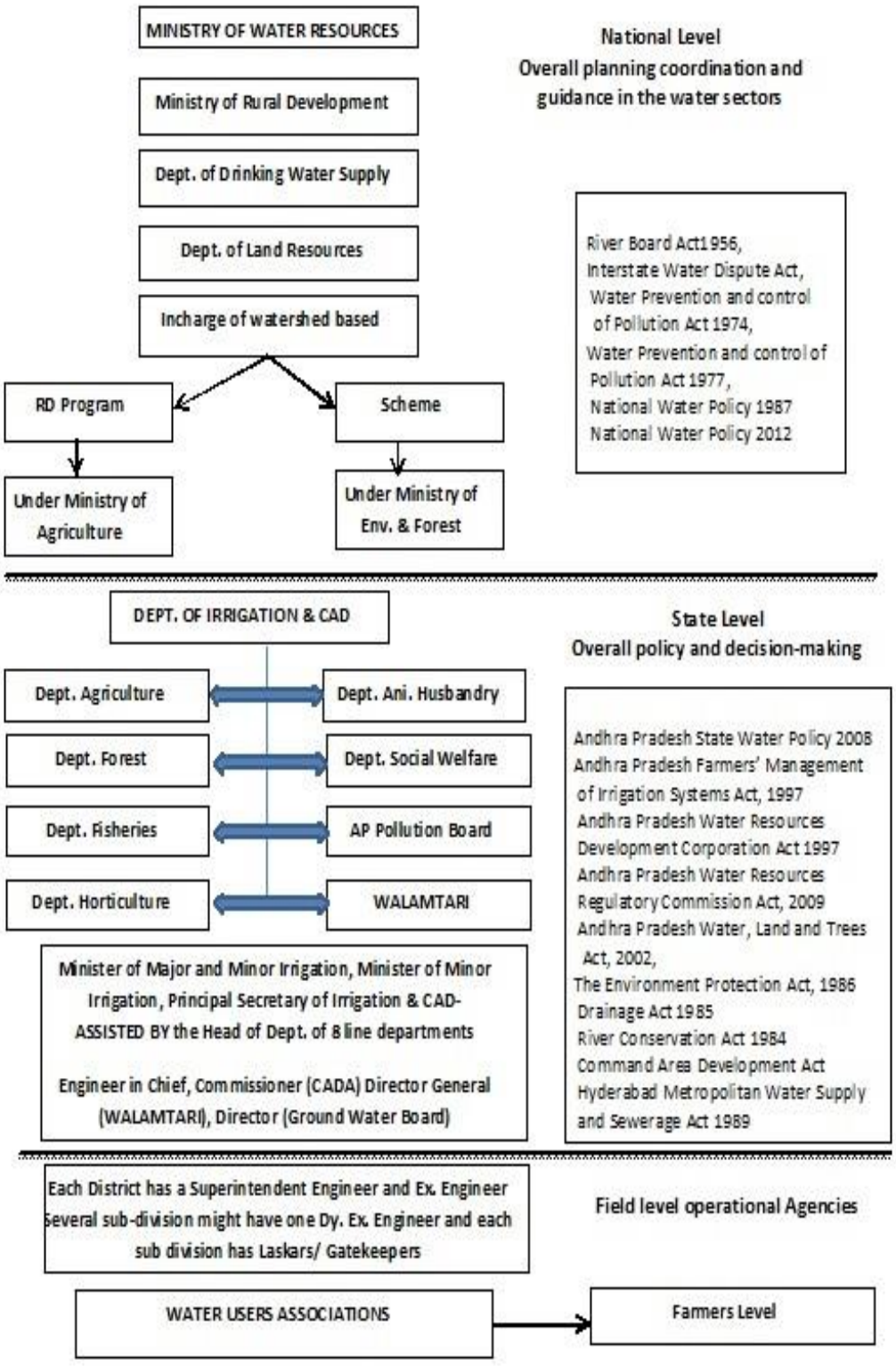

Figure 2-2: Hierarchy of Water Resource Planning Departments in India

Source: own interpretation adapted from Department of Irrigation, Government of Andhra Pradesh (2012)

2.8 Provision for Water Resources in Andhra Pradesh

The case study of Hyderabad water allocation essentially deals with water user, uses and allocation across different sectors in Andhra Pradesh, which is entrenched and characterized by a complex network of different water-related departments and its responsibilities in the state. Whilst Table 2.6 gives the overall administrative provision of water resources in Andhra Pradesh, this section outlines the independent and corresponding departments to handle both irrigation and drinking water and the overlapping of the jurisdiction of departments involved in the inter-sectoral allocation of water in Hyderabad's study context.

Table 2-6: Administrative Provision of Water Resources in Andhra Pradesh

Nature of responsibility	Ministries responsible	Departments responsible	Specific sub-divisions responsible for 'water' related activities
Drinking water, water development and wage employment	Ministry for Panchayat Raj, Rural Development, Rural Water Supply and Wage Employment	Panchayat Raj and Rural Department	Planning, construction, operation and management of rural water supply, minor irrigation tanks having a command area of less than 40 ha, implementation of watershed development, drought-prone area, employment assurance schemes
	Ministry for Municipal Administration and Urban Development	Public Health and Municipal Engineering Department	Planning, construction and maintenance of urban water supply, drainage, sanitation and sewage treatment systems in urban local bodies Hyderabad Metro Water Supply and Sewerage Board: Planning, construction and maintenance of urban water supply, drainage, sanitation and sewage treatment systems in Hyderabad and 10 surrounding municipalities
Water Resources Development	Ministry for Minor Irrigation, AP Industrial Development Corporation (APIDC),	Departments for Major, Medium and Minor Irrigation, APIDC and Groundwater	Basin-wise planning of State water resources, monitoring of river flows, sediment loads, hydrological studies for projects and seeking approval from central waters commission, design, planning, construction and maintenance

	Ground Water Development and Sericulture Ministry for Major and Medium Irrigation	Development and Sericulture	of major, medium and minor irrigation schemes, Implementing the APFMIS
	Ministry for Agriculture and Horticulture	Agriculture and Horticulture Department	Formation of district-wise agriculture – production, intensification plans, agriculture extension, integrated nutrient and pest management, promotion and extension of horticulture activities and drip irrigation
	Ministry for Energy	Energy Department	Hydro and thermal power generation and distribution
	Ministry for Forest, Environment, Science and Technology	Department of Forest, Environment, Science and Technology	Promotion of forests regeneration and rainwater harvesting in forest areas, supervision of works of wildlife wing, Andhra Pradesh Pollution Control Board responsible for enforcement of: Water Prevention and Control of Pollution Act 1974, Water Prevention and Control of Pollution Act 1977, Air Water Prevention and Control of Pollution Act 1981, the Environment Protection Act 1986, Hazardous Chemicals and Wastes Handling Rules 1989

Source: Government of Andhra Pradesh (2012)

2.8.1 Irrigation Water in Andhra Pradesh

Raymond (2001: 7) examined the irrigation reforms in Andhra Pradesh and elaborately charted the administrative structure of the irrigation sector, which is principally under the Irrigation and Command Area Development Department (ICADD from hereon). There are three levels of administration. The highest level is governed by the following; Minister of Major and Medium Irrigation, the Minister of Minor Irrigation and the Principal Secretary of ICADD. In addition, three to four Secretaries of related departments are included, each of whom is further supported by three to four Deputy or Joint Secretaries. The second level

comprises of the heads of the following departments; the Engineer in Chief (Irrigation and Administration), the Director General of the Water and Land Management, Training, and Research Institute (WALAMTARI), the Com- missioner of the Command Area Development Authority (CADA), and the Director (Ground Water Board). The third level is placed at the district level, mainly responsible for field operations and management. Here the Superintending Engineer has jurisdiction over one or more districts. In practice, each irrigation division comprises of three or four subdivisions which are overseen by a Deputy Executive Engineer. Each subdivision is further sub-divided into three or more sections under the jurisdiction of an Assistant Engineer, which is supported by one or more inspectors. At the lowest level are the gatekeepers (*lascars*), assisting the management and distribution of water in the fields. Figure 2-3 shows the structure of the Irrigation Department at the State and District Levels.

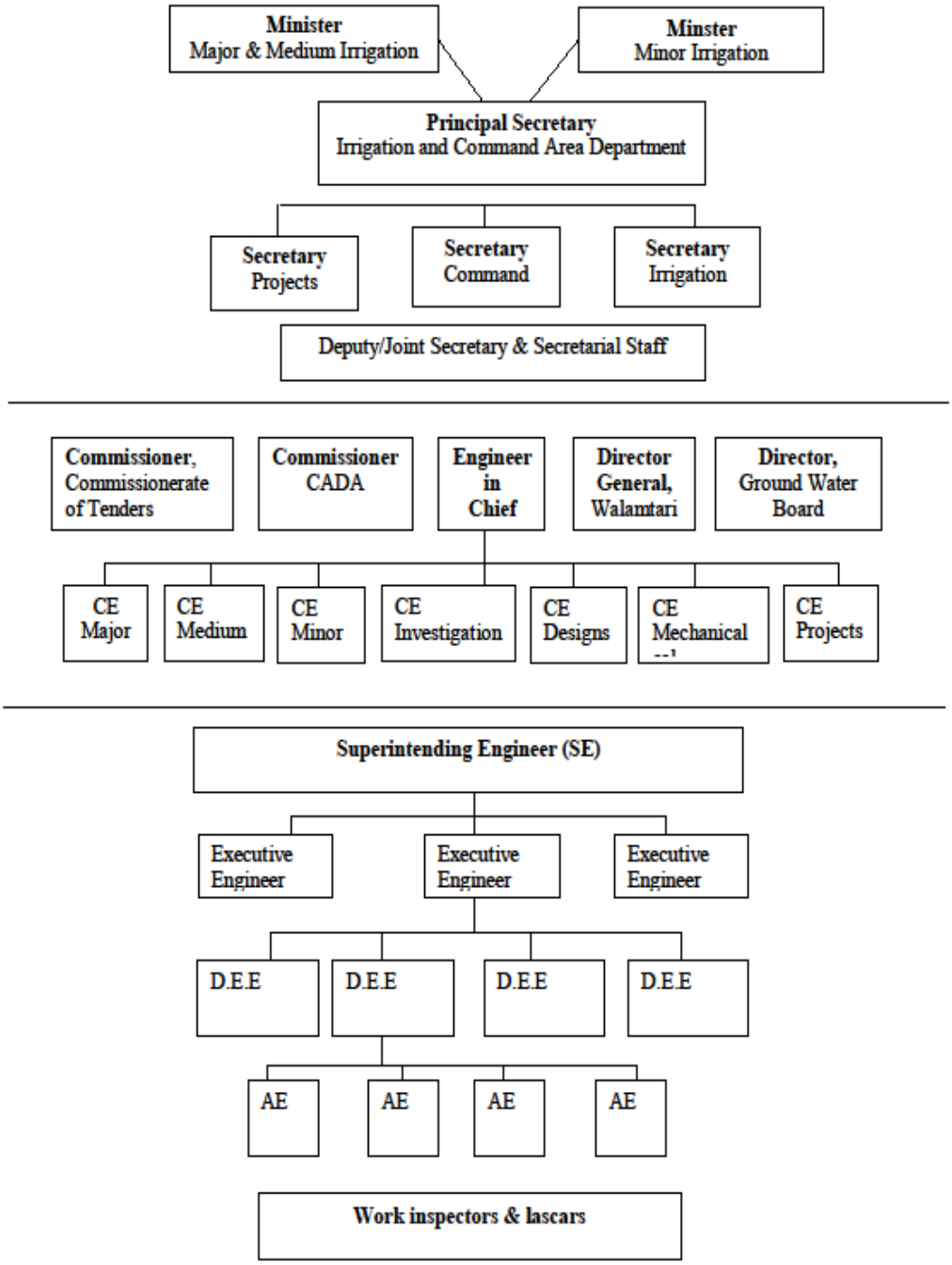

Figure 2-3: Structure of the Irrigation Department of Andhra Pradesh

Source: Department of Irrigation, Government of Andhra Pradesh (2013)

2.8.2 Drinking Water in Andhra Pradesh and Hyderabad

Ramachandrudu et al. (2009: 10) charted the administrative set-up of the rural drinking water in Andhra Pradesh. The Rural Water Supply Department is the key agency responsible for designing and implementation of Water Supply ser-vice in the rural areas. It was formed in 2007 by the Government of Andhra Pradesh. To chronologically trace back the evolution of the Rural Water Supply Department, in 1960 the Panchayati Raj and Engineering Department (PRED) was created to take care of rural development which also included the rural water supply. In the year 1965, a separate independent post was formed to look after rural water supply and sanitation, which however did not meet the desired expectations. Therefore, the Government trifurcated the Panchayati Raj and Engineering Department (PRED) into Panchayati Raj, Rural Water Supply Department and Rural Development.

In the case of urban drinking water, Rao et al. (2012) noted that under the Municipal Administration and Urban Development Department (MAUDD), the Public Health Engineering Department (PHED) is responsible for all operations and activity concerning Water Supply and Sewerage Schemes in all the 110 Municipalities in the state of Andhra Pradesh and 11 Municipal Corporations. However, in the case study context, under the same department of MAUDD, Hyderabad city has an independent body called the Hyderabad Metropolitan Water Supply and Sewerage Board (HMWSSB) responsible for all operational and management activities pertaining to Hyderabad's water supply. Prior to the creation of the Water Board in its current form, it was the Hyderabad Water Works Department (Government of Andhra Pradesh) which was responsible for supplying drinking water to the city of Hyderabad. A Chief Engineer under the Municipal Administration Department headed the Hyderabad Water Works which functioned as an Engineering Department to facilitate water supply to the city. However, to ensure a greater degree of financial autonomy in order to enable effective planning and management, the government created the Water Board in 1982.

Sahu (2012: 150) chronologically charted the institutional arrangement for urban water resources in the state of Andhra Pradesh. The Water Board was created through the enactment of Act 6 in 1982. The administrative arrangement of the Water Board made provision for a competent person (experienced Administrator or Engineer with technical expertise in the area of water) to head the Board. In addition, provisions were made for community representation

with different interests to specifically endorse and encourage public participation in water resource management. It is interesting to note that the very premise of forming the Water Board was one of the pre-condition set by the World Bank to avail its loan. However, the loan failed to come through and the Water Board ceased to exist. The water management in the state resumed as how it functioned prior to the setting of the Water Board. The government however re-drafted the Act in 1989 in order to create the Board, what is today known as the Hyderabad Metropolitan Water Supply and Sewerage Board (Act 15 of 1989) with the organizational structure as described in Figure 2.4. Subsequently, in 1990, a loan from the World Bank for Hyderabad water supply and sanitation was granted. The provision for public representation was removed on the grounds that too many diverging interests would have hindered the smooth functioning of the Water Board.

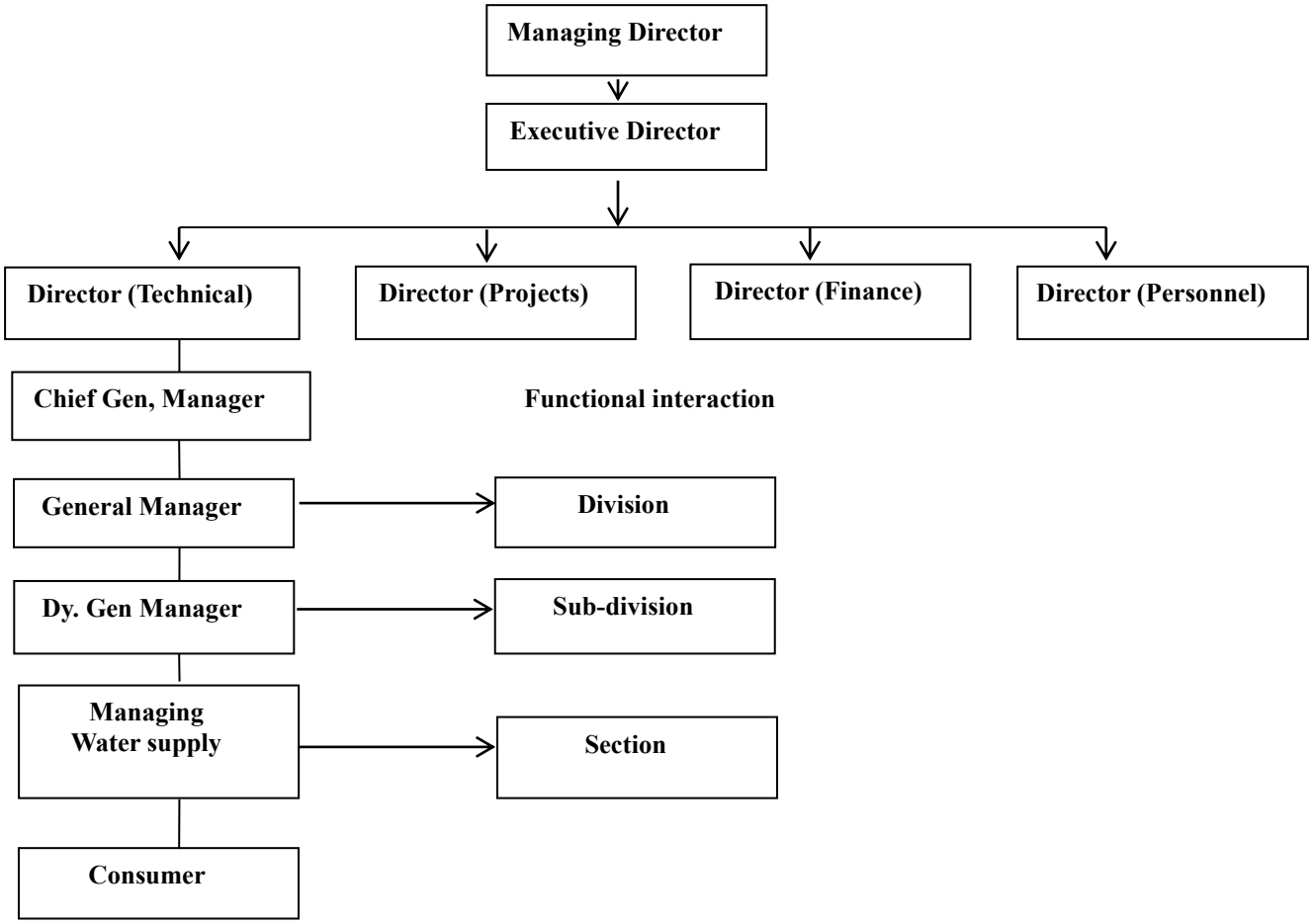

Figure 2-4: Organization Chart of Hyderabad Metropolitan Water Supply and Sewerage Board

Source: Sahu (2012: 153)

Celio (2007: 6) illustrated how the constitution of the Hyderabad Metropolitan Water Supply and Sewerage Board was formed with the encouragement of the World Bank to allow and equip the Water Board with financial autonomy. Provisions were made in order to enable the Water Board to function with great financial autonomy. Provisions were also made in order to enable the Water Board to function with great operational and decision-making control. This arrangement of financial autonomy was to specifically safeguard the Water Board from political interferences. However, the Water Board was far from achieving its objective of financial autonomy because water fee collected was extremely low. Further, the Chief Minister serves as the Chairman of the Board of Directors of the HMWSSB, which rather emphasized the Water Board's dependence on the Government of Andhra Pradesh, to be eventually under the control of the political establishment (Table 2-7).

Table 2-7: Board Members of Hyderabad Metropolitan Water Supply and Sewerage Board

Hon'ble Chief Minister of Andhra Pradesh	Chairman
Hon'ble Minister for Municipal Administration and Urban development	Vice Chairman
Chairman A.P Pollution Control Board	Ex–Officio Director
Principal Secretary, Municipal Admin and Urban Dev., Secretary Finance, Govt. of Andhra Pradesh	Ex–Officio Director
Special Officer and Commissioner, Municipal Corporation of Hyderabad	Ex–Officio Director
Director, Health, Govt. of Andhra Pradesh	Ex–Officio Director
Director (Technical), HMWSSB	Ex–Officio Director
Director (Finance), HMWSSB	Director
Managing Director, HMWSSB	Director

Source: Hyderabad Metropolitan Water Supply and Sewerage Board (2012)

In principle, the HMWSSB is supposed to have the overall control over its five water supply sources and its infrastructures. However, the two key water sources are under the control of the Irrigation Department with a water sharing mechanism in place which has been a basis for protracted contention. These two key water sources are Singur reservoir across Manjira River and Nagarjuna Sagar dam across Krishna River (I and II Phases), supplying almost 70 percent of the water to Hyderabad. The Singur reservoir is operated by the Irrigation Department and releases water to Ghanpur and Nizamsagar for irrigation purposes after being jointly agreed upon by the Principal Secretary for Irrigation and the Managing Director of the HMWSSB.

Such release of water is based on the dam operation rules of water allocation for Hyderabad and agriculture (Government Order 93). However, in the case of disagreement between the Principal Secretary and Managing Director, the Chief Minister who is also the Chairman of the Water Board takes the final decision on the matter. Celio (2007: 7) further illustrated a comparable situation of water being brought to Hyderabad from Krishna River by utilizing pre-existing structures controlled by the Irrigation Department.

2.9 Property Regimes and Institutional Arrangement for Water Allocation

This section explains the concept of property rights and categorizes the institutional arrangement for water allocation and the type of water transfers relevant to Hyderabad's study context. According to Bromley (1992), the concept of property regime defines the role of different actors in relation to a resource system and characterizes relationships between individuals with respect to a specific good or benefit. Based on this, different property regimes exist as pointed out by Ostrom (1990) and Bromley (1992). In private property, legal individuals hold rights, whereas a group of individuals hold rights in common property. In state property, the state holds the rights; however open access characterizes the absence of any property rights. Based on this characterization, three key institutional arrangements for water allocation have been identified by Bruns and Meinzen-Dick (2005) which essentially centers on different actors managing the resource. However, it must be noted that water allocation arrangements in general exists in a combination of several aspects of the three forms and is rarely present in the pure form.

User-Based Allocation. A very good example of this type of allocation is farmer-managed irrigation systems (Dinar, Rosegrant, and Meinzen-Dick, 1997). Here variation of rules for allocation is based on timed rotation; the area of land owned or shares of the flow (Yoder, 1994). In general, for this type of water allocation, the presence of collective action institutions is necessary with authority entrusted to them in them to make decisions on water rights. Empirical evidence on studies of common-pool resource management including water has shown such institutions evolve spontaneously. However, this type of allocation does not necessarily ensure efficient water allocation (Meinzen-Dick and Men-doza, 1996). In this type of allocation mechanism, property rights remain a critical factor (Coward, 1986). If they have

no rights, (de facto or de jure) over that particular water resource, then the user groups are unable to make decisions (Meinzen-Dick and Mendoza, 1996).

Market Allocation. In this type of allocation, water markets allocate water by means of tradable water use rights. Here, voluntary exchange of water use rights between willing buyers and willing sellers for legal rights of water take place. In such an exchange process, water can be transferred all or in part, separately from the transfer of land. To implement such an exchange, it is important to have clearly defined characteristics of water rights and the regulations governing the trade of such water rights which in a way asserts the bargaining power of the farmers and the farmer groups. This will allow the water users to exercise their rights to consent to any reallocation of water or compensation for any water transferred (Dinar et al., 1997; Wang, Fang, and Hipel, 2003). However, a necessary condition for such market to become operational must be created by the government. Conditions, such as defining the original allocation of water rights, creating the institutional and legal frameworks for trade and finally investing basic necessary infrastructure to allow such water transfers to take place (Holden and Thobani, 1996).

Public (Administrative) Allocation. This type of allocation takes place where water is considered as a public good (Wang et al., 2003). This is generally applicable in large-scale irrigation systems. Here the state decides what water resources can be used and accordingly allocates and distributes water within different parts of such system. Municipal, industrial and rural water supply also falls under this type of allocation. Even though Hydropower sector is a non-consumptive use, it falls under this category of water allocation. This type of water allocation is fundamentally determined by water quantities based on the physical norm and also more importantly on the political influence. The role of the state is of prime importance, particularly in the inter-sectoral allocation, be-cause the state not only has jurisdiction over all sectors of water use, but the state is the only institution. In this regard, most countries maintain the fact that the state holds navigable waters as an aspect of sovereignty, as a result of which it has reaffirmed the state's role in allocating water between different sectors such as agricultural, industrial, municipal, electricity and the environmental sector. In the research context, Hyderabad's case of water allocation falls under this category which will be discussed in detail in the later sections of the thesis.

2.10 Perspectives on Inter-Sectoral Water Allocations and Types of Transfers.

Lund and Israel (1995: 195) suggested that whilst water transfer among similar users, such as such as farmer to farmer and municipality to municipality were common, water transfer between sectors is a relatively recent phenomenon. This obviously reflected the trend in the increasing need of municipal and industrial demand. As a result, there was increasing pressure to transfer water from major water user, primarily from the agricultural sector to these water hungry sectors (Levine, Barker, and Huang, 2007). Saleth and Dinar (2001) pointed that in order to meet the growing urban demand, water supply has been augmented by bringing water to the city from distant sources by tapping new sources as well as multiple-use water sources. This inherently disrupted the existing water allocation between these different sectors, eventually giving rise to inter-sectoral water conflicts. Molle and Berkoff (2006: 13) describe a typology of how water is transferred in practice from agricultural to urban uses. He proposed different types of transfer and transfer mechanisms and explained how water transfers occur in practice as well as their consequences with some examples of cities that are reviewed in Table 2-8.

Temporary transfers typically occur during a drought. If the source is large, the impact on irrigation users may diffuse and be unidentifiable. If the transfer is a large portion of the source, often the case during droughts, then temporary allocation directly impacts on a known group of farmers who may have to be compensated for their temporary loss. Once the emergency is over, allocations revert to the original pattern. Gradual permanent transfers occur when a source of water already tapped by several users is progressively diverted to the benefit of a city. In such cases, the transfer typically first amounts to a limited percentage of the source of origin and the effects diffuse and are largely unidentifiable since the source continues to provide a large share of water to other users. Out-right permanent transfers often involve viciously reallocating water from one user to another. If the amount of water is relatively limited it can be more easily accommodated. However, if the transfer or diversion makes up a large part or all of an existing source, for instance, converting irrigation reservoirs to municipal use, then the transfer is likely to be chaotic if no compensation mechanism is in place. Whilst some transfers are explicit and obvious; others are carried out underhand.

Table 2-8: Classification of the Types of Water Transfers

	Large percentage of the source of origin	Limited percentage of the source of origin
Temporary transfers	Deep wells to Chennai; Transfers to Seville, Manila	Drought transfers from Krishna River to Chennai; The Californian Water Bank
Permanent transfers		
A.Gradual transfers	Zanghe reservoir and Northern Plains (China); Jordan River to Amman, and Chao Phraya River to Bangkok	Irrigation water to Chiang Mai; Krishna River water to Hyderabad; Transfers from Acequias in New Mexico
B.Outright transfers	Diversions to Mexico City and from Yangtze to North China; Diversion of the San Juan River to supply Monterrey; Buying out of irrigation dams by Tsingtao and of wells by Chennai	Transfer from Bhavani River to Tirupur or from the Zayandeh Rud to Yazd; Diversion of Mae Klong River to Bangkok; of Kelau River to Kuala Lumpur and Melamchi River to Katmandu

Source: Molle and Berkoff (2006: 13)

3 Property Rights and Distributional Conflicts in Resource Allocation

Overview

This chapter opens by giving a theoretical perspective on the definition and origins of property rights and explains the role of property rights in conflicts in natural resource management. However, to study such conflicts; the definition of institutions and institutional change is conceptualized. Thereafter, conflicts and institutional change in Knight's theoretical concept is explained with its applicability to Hyderabad's inter-sectoral water conflicts. Finally, the Institutional Analysis and Development (IAD) Framework and its applicability to carry out the research is elaborated.

Hyderabad's urbanization and its inter-sectoral water contestation, conflict and competition with the agricultural sector have been fuelled by persistent arbitrary water reallocations. These arbitrary water reallocations have been taking place against the administratively prescribed allocation guidelines over the years, with detrimental consequences for both the sectors. Resting on the foundations of the New Institutional Economics (NIE) perspectives on property rights; this study seeks to examine the 'inter-sectoral allocation mechanism' in place which perpetuates such arbitrary reallocations. To succinctly translate the key research question of why such arbitrary reallocations persist against the prescribed allocation guidelines into Ostrom's language, this study seeks to fundamentally examine the persistence of rules-in-use, despite the rules-in-form already in place.

From an NIE perspective, property rights include the full range of rules that impact individual actions regarding the use and exchange of the benefits flowing from a good. The concept of property rights is essentially understood as occurring within institutional rules whose design is sometimes exogenous to individual decision-makers. These same individuals then react to external rules and create other institutional mechanisms to reallocate the benefits and responsibilities assigned to various goods depending on the incentives and resulting transaction costs of external institutional structures. Therefore, property rights institutions may be understood as a result of 'individual decisions to support specific institutions' as nested within broader institutional structures. This study employs the Institutional Analysis and Development (IAD) framework (Ostrom, 1990; Ostrom, Gardner, and Walker, 1994). The

framework can explain such variation of property rights institutions by examining the full range of influences on individual decision makers at multiple levels with the impact of formal institutional structures. The framework integrates multiple levels with the impact of formal institutional structures. The framework integrates multiple disciplines dealing with the question of how institutions affect the incentives that confront individuals and their resultant behaviour, to eventually help explain the ways in which institutions operate and change over time. In order to study such human interaction in the context of limited resources and the resulting resource conflicts, Knight's distributive bargaining theory of institutional change provides an explanation why institutional change and conflict persists over time. Overall, the study seeks to employ the existing theoretical explanations of property rights and attempts to provide a case on the applicability of contemporary theories of institutional change to the context of water resource conflicts in Hyderabad.

3.1 Definition and Origins of Property Rights: A Theoretical Perspective

An array of definition on property rights exists in the literature. Furubotn and Pejovich (1972: 1139) explain property rights as a claim to a resource with entitlements. These entitlements include not only to its use but also entitlements to change its form or transfer the rights through sale or rental. They added that behavioral sanctions pertaining to the use of the resources that must be abided by others are also crafted. Bromley (1991: 15) views property rights as a claim on a stream of benefits. It is essentially characterized by the enforcement mechanisms where others have the obligation to abide by it, which makes provision for its access, use and overexploitation.

Libecap (1998: 77) views property rights as social institutions which define the entitlements that are granted to water and a specific parcel of land. According to Commons (1968), property rights are essentially recognized claims and obligations, rights and duties or responsibilities. When it comes to property rights over resources, it includes ownership rights, use rights which typically includes access and withdrawal rights, and decision-making rights which entails not only managing the resource, but also excluding or alienating others from accessing the resource (Rout, 2008; Schlager and Ostrom, 1992: 250; von Benda-Beckmann, von Benda-Beckmann, and Spiertz, 1997). In terms of property rights in natural resources, Hanna et al. (1996: 1) explain how property rights structure human behavior and their

interaction towards the use and regulation of the environment. Here, both the rights to resources are crafted as well as the rules under which those rights are explicitly exercised.

Alston et al. (1996: 31) similarly view property rights as an individual's rights to access and use of resources, which is enforced upon other members to recognize the individual's rights. Therefore, the central to the array of definitions implies that property rights are essentially social institutions that craft relationships among people with regard to a particular resource. It does in no way imply physical ownership, or relations between the owner and the physical entity, but rather crafts relation amongst people pertaining that particular resource, object or physical entity. One of the most important sets of rules influencing resource management is property rights (Ostrom, 1993). According to Ostrom and Schlager (1992: 249), the political economists view that property rights and the rules that enforce these rights often shape how resource degradation problems are perceived. Therein prescriptions are recommended to solve such degradation problems. Whilst the terms rights and rules are interchangeably when made in reference to natural resources, Ostrom and Schlager (1992: 250) however reiterates that rights are in fact the product of rules and in no way equal to rules. Whilst rights authorize action, rules are essentially prescriptions that create such authorizations. This concept implies when an individual holds a property right; rights can only be exercised according to what is authorized in the rules.

The different schools of thoughts have varying perspective on the concept of property rights. The legal perspective understands property rights as a set of relationship between individuals. Here it not only prescribes liberties of an individual to take a set of action but also enforces others to uphold and respect those liberties of the individual (Hohfeld, 1920). In this line, Cole and Grossman (2002) subscribe to the notion that property rights for most legal scholars entail legal recognition by formal enforcement authority. The institutional economists understand property right as a form of authority enforced to take on particular actions within a specific domain (Commons, 1968). On the other hand, the modern institutional economists perceive property rights as a claim on a stream of benefits, which is not secure unless it is characterized by enforcement mechanisms where others have the obligation to abide by the conditions that protect that particular stream of benefit. In other words, it structures the rights and duties that prompt relationship amongst individuals pertaining to a particular resource (Bromley and Cernea, 1989: 5). According to economic historians, rights to a particular

property are almost never completely specified and enforced in any society. While some of those rights are inherently reserved for the society, other rights cannot be enforced; which results in those rights being appropriated by others (North, 1990: 33).

Kauneckis (2004) eloquently highlights the debate and reviews the definition, origins and the sources of property rights institutions by tracing the essence of property rights in four traditions: legal scholarship, economic, political science and institutional perspective on 'property'. According to Kauneckis (2004: 36), most of the legal scholars base their concept of property rights, which must be backed by some form of legal recognition by formal enforcement authority (Cole, 2001). It was Hohfield's (1919) work which made way into the legal perspective of property rights. Here, property rights were understood as the relationship between individuals to both liberties and duties and legally defined four types of relationships. Cook (1919: 724) highlighted Hohfeld's interpretation of these four rights rights as legally defined social relationships, which included a liberty that is bestowed to undertake an action, a claim to the benefit that others are obliged to respect and uphold that individual's action, the capacity and the liberty to change legal relations, and finally enjoying the protection of immunity that denies others to change one's legal relation. According to Lazarev (2005), Hohfeld's analysis of rights underlines the legal positions or entitlements which are essentially interconnected with each other based on logical relations of entailment.

Under this 'legal perspective of property' school of thought, the rights enforced and protected by legal actions is based on 'public trust' doctrine. Here some categories and types of natural resources are deliberately protected from public access. In addition, the state's responsibilities to protect the resources from over-exploitation are also justified.

However, critique to this school of thought particularly the modern economist pointed out the existence of property rights in some stateless societies. This argument underlined the need for alternative mechanisms that essentially guaranteed property rights. Despite modern economists' view on how the state can sometimes be the violator of these rights, rather than protecting them, the legal literature ascertained that property rights rests on the enforcement activity and continued to emphasize how the state can act as the only source of enforcement.

Kauneckis (2004: 39) further summarized the economic perspective on property rights. Whilst property rights from the legal perspective implied legal recognition by formal enforcement authority (Cole, 2001); the economic thought did not emphasize on either the source or ownership institutions (Demsetz, 2002: 653-654) until Coase's work in 1959. He argued and disagreed with the justified perception for the government to manage and regulate the use of shared resources. Coase's concept was on the premise that as long as property rights are well-defined with low transactions costs, there is every possibility of internalizing the externalities through bargaining among affected parties. Interestingly, the effect of transaction costs on the ability of cooperative solutions to emerge (Allen, 1998) came into focus, which is the basis of what is today known as the new institutional economics school of thought.

Following this school of thought, Demsetz (1967: 348) further argued that private property is the most appropriate way to make the individuals internalize the externalities. It also perceived that the institution of private property was bound to inherently emerge spontaneously as per desirable circumstances after weighing in the cost-benefit comparisons. In other words, private property rights in reality will emerge spontaneously to increase efficiency and makes an attempt to internalize transaction costs. Sole ownership essentially allows the owner (private, community or the government) the opportunity to manage and regulate in a way that maximizes the net present value of the resource. If the owner is entitled to the sole right to reap the benefits of good and rational decisions, she or he would have every motivation and incentive to make them. Kauneckis (2004: 41) further explained how Barzel (1989) similarly subscribed to the argument in assuming property rights as an institutional tool to rectify or provide solutions to ill-defined rights. Overall, the economists have provided an explanation of property rights institutions, independent of any government action.

Kauneckis (2004: 42) also elaborated the shift of the political approach to property rights from the state enforcement activity, to the decisions particularly made by specific actors within the government. It focused on the strategic choices made by the actors within the government and the institutions that exert influence over those choices being made. Whilst the economic tradition largely kept the political aspect of property rights away from its mainstream argument, the tone of its importance subtly surfaced throughout the literature particularly in the work of Coase (1959: 14), where he cited the importance in the role of

formal government institutions. Similarly, Demsetz (2002: 664), a proponent of private property explained the role of government, without which a private enterprise would not function properly. The role of political actors was brought to the forefront by public choice scholars. Buchanan's approach to property rights institutions (Buchanan, 1975; 1977; 1993) argued that the source of property rights security was to be vested primarily in the constitutional structure. This argument was largely criticized by Sened (1997) by explaining that in Buchanan's concept, securing property rights has no distributional consequences and all would benefit from the final outcome. Furthermore, by expressing it in cooperative terms, it assumed that a constitutional promise was credible enough to guarantee property rights security. The state had no reason to abandon its position from the strategy of providing enforcement of property rights. Rights would emerge as a dominant strategy where no party would have any incentive to abandon. Addressing property rights as a result of political institutions has also been examined under the new institutional economics framework. North (1990) in observing the relationship between economic growth and property rights institutions argued that while the government was the best provider of effective enforcement, however, there was no guarantee that government would necessarily protect rights that would promote efficiency.

Libecap (1989) further argued the valid consideration of efficient property rights, when such variation in property rights systems exists. He explained that property rights would emerge from the political process of negotiation, instead of merely being enforced or allocated efficiently, by elaborating the history of property rights formation in the United States of America. Here rights were allocated according to political favor, without any considerations of efficiency. Similarly, Firmin-Sellers (1996: 4) explained property rights as emerging from a process independent from the considerations of efficiency.

Kauneckis (2004: 50) explained how the political approach to property rights institutions exerting emphasis on the decisions made by specific government actors (and rather moving away from the concept of state enforcement), made way to another school of thought. It typically consisted of economist and political scientists within the new institutional economics tradition. Scholars within this approach contested that focusing on the role of formal government alone (legal approach) or that of individual agents in a market exchange (economic approach) overlooked the real institutions that define relationships of property.

Hence they drew their attention towards examining the specific configuration of institutions that influenced property rights arrangements. It examined on how actions by the government entities and individual right-holders may actually influence the various forms of property rights. Researchers undertaking the institutional analysis approach have provided an interesting perspective on how the various types of institutions influence property rights arrangements. This approach known as the Institutional Economics approach draws from both the legal scholarship and economic understanding of property.

The Institutional Analysis and Development (IAD) framework (Ostrom, 1990; Ostrom, Gardner, and Walker, 1994) is an analytic framework that can explain the variation in the institutional form in complex nested institutional structures, determining the specific choice situation of individual actors. It is a conceptual framework which integrates multiple disciplines dealing with the question of how institutions affect the incentives that confront individuals and their resultant behavior that can be applied towards understanding the water conflicts in Hyderabad.

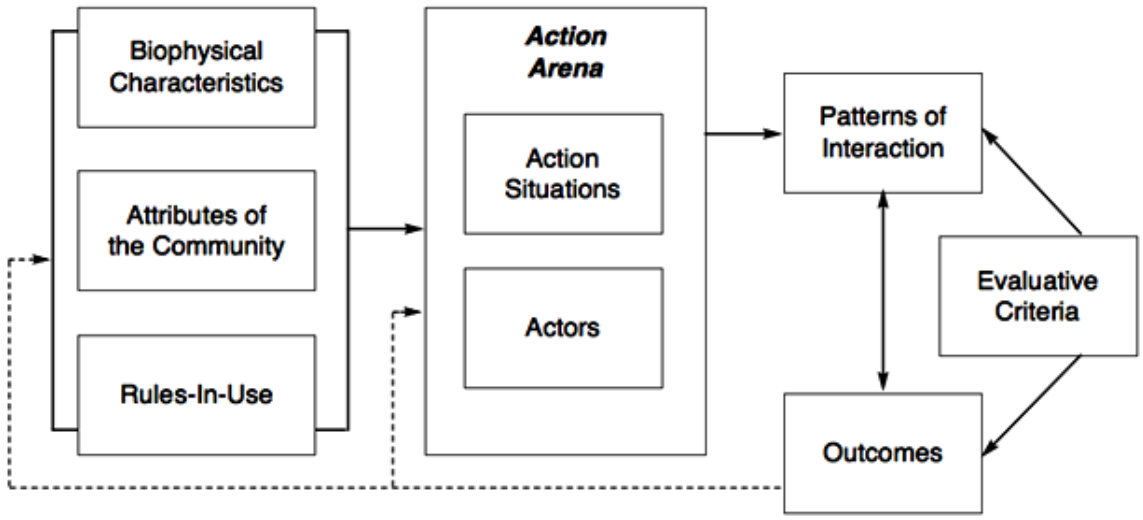

Figure 3-1: The Institutional Analysis and Development (IAD) Framework

Source: Ostrom (2005)

The core essence of the framework lies in the action arena, essentially consisting of an action situation and the participant. An action situation is the social space where individuals or

groups of individuals interact and outcomes are produced. The behavior of participants in the action situation is influenced by three sets of exogenous variables which include the biophysical and material conditions of the setting, attributes of the community and the rules that participants have to follow. The action situation can be further broken down into seven working components; (1) the set of participants, (2) the positions to be filled by participants, (3) the potential outcomes, (4) the set of allowable actions and the function that maps actions into realized outcomes, (5) the control that an individual has in regard to this function, (6) the information available to participants about actions and outcomes and their linkages, and (7) the costs and benefits which serve as incentives and deterrents assigned to actions and outcomes (Ostrom 2005: 14). The action arena leads to interactions, which produce outcomes, which can in turn feedback and change the action arena and the exogenous variables. The IAD framework adapted to carry out the study, describing each variable is presented in Section 3.5.

3.2 Property Rights and Conflicts in Natural Resource Management

While looking into the concept of conflict of property rights in natural resources; the term 'conflict' as used here refers to situations where disputes question existing and settled formal and informal institutions. According to Yandle (2007: 2), some scholars, particularly Demsetz (1967), Libecap (1989), Hanna et al. (1996) and Pearse (1988), focused their work in examining the role and influence of property rights in natural resource governance regimes. Yandle (2007: 2) stated that the likelihood of persistent conflicts among different sectors arises when a variety of property rights arrangements are created to manage individual resources. The result may be the creation of incompletely defined property rights arrangements, causing conflicting expectations among resource users. In some cases, there are property rights mismatches (Cash et al., 2006; Crowder et al., 2006; Wilson, 2006; Young, 2002), creating ambiguity and thereby causing conflict in resource use (Yandle, 2007: 2). Mismatches in property rights generally imply problems in the incompatibility of temporal and spatial resource characteristics with institutional characteristics. Typically, property rights mismatches are likely to occur over water resources (Yandle, 2007: 1), where multiple types of resource use and resource user can be engaged and managed under a variety of regulatory regimes.

Bues (2011: 20) explained the analysis of three different situations with regard to conflicts in natural resource management. The first type of conflict takes place under a situation where no rules are present. Here, the property rights school considers non-established, poorly defined or enforced property rights as an important reason for conflict (Alston, Eggertsson, and North, 1996; Demsetz, 1967). In the context of water resources, coordination becomes more complex, as water scarcity increases with increase in population (Meinzen-Dick and Nkonya, 2005), as a result of which pressure emerges to define rights (Alchian and Demsetz, 1973). The central to the property rights theory propounded by these scholars essentially forms the property rights paradigm, where it assumes that better the property rights are delineated and the lower the transaction costs, the better the parties involved are capable of internalizing the externalities. According to Bues (2011: 21), the second type of conflict situation which occurs in the process of creating rules is essentially characterized by a bargaining process (Knight 1992). As property rights distribute social outcomes, each strategic actor eventually seeks to achieve the best distributive outcome. Therefore conflicts are inevitable in process of rules creation over institutions which seek to distribute benefits. The third conflict situation presents the case where conflicts occur even after the rules are established. According to Knight (1992), the actors with the more powerful bargaining power will make a full endeavor to promote their interest of distributional goals. On the other hand, the other group of actors unhappy with the arrangement will try to rectify it. The process to change and rectify the rules will entail violations, individually or collectively, which will likely be resisted by the group of actors benefitting the current arrangement of rules (Knight 1992: 59). In this sense, conflict persists despite an agreed rule is already established.

3.3 Institutions and Institutional Change

The array of definitions of institutions that exists along with its various constituents reflects the range of diversity and the various levels at which they exist. North (1991: 97) explains institutions as constraints that are crafted to regulate interactions within the political, economic and social spectrum of the society. However, North (1995: 15) subsequently redefined institutions as the constraints on human interactions that human beings impose on. The redefinition of institutions as constraints, rather than rules further opened the possible discussion of the distinction between formal and informal constraints. According to Ostrom (2005: 3), institutions are defined as a “set of prescriptions and constraints that humans use to

regulate all forms of repetitive and structured interactions. These set of prescriptions can generally be embedded in rules, norms, and shared strategies" (Crawford and Ostrom, 1995; Ostrom, 1997).

Ostrom (2005: 3) pointed out that the opportunities and constraints that individuals face in any situation, the information and the benefits they obtain or benefits excluded from, and how they reason about the situation are all affected by the rules or the lack of it, which eventually structures the situation. This is due to the presence of formal or informal rules which crafts and assigns what access individuals can have, to the resources in question. Thereof, this allows individuals to make certain choices and decisions to gain the maximum benefit out of such an arrangement. Knight (1992: 2) considers an institution to be a set of rules that structure social interaction in particular ways. According to North (1990) and Ostrom (1998), institutions exist as long as interactions exist and thereby play a role in an exchange process between individuals with different resource entitlements. For instance, Ostrom (1990; 2003) pointed out the role of institutions in governing interactions amongst multiple individuals dependent on the same resource, where each individual has their own interest and hence their action influences the benefits of others. Similarly, for diverse interactions; diverse institutions are constantly being created due to increasing economic development that eventually requires new forms of interactions. Institutions are thus inherently embedded in complexity. While institutions provide opportunities for interaction; it also comes with huge challenges to understand them (Ostrom 2005; Yifu Lin and Nugent, 1995).

Schmid (2004) classified institutions as formal and informal institutions, where the formal are those often written and adopted consciously. Formal institutions which generally are constitutions and laws, before being enacted are deliberated upon by the public, after which they are essentially protected and enforced by the state. On the other hand, informal institutions are those unwritten rules and norms which spontaneously emerge, as a result of continuous interactions amongst individuals within the society. In this regard, North (1995: 15) while defining institutions as constraints on human interactions imposed by humans beings themselves, points out that these constraints with enforcement characteristics may be formal (constitutions, law or regulation) and informal (norms, conventions, codes of conduct). Ostrom (2005: 3) similarly defines institutions as a "set of prescriptions and constraints that humans use to organize structured interactions". She further delineated such institution as

being formal (rules-in-form) or informal (rules-in-use). Anderson (2006) summarized the concept of formal and informal rules as present in the literature. The formal comprises of rules and procedures that are created, communicated, and enforced through official channels which essentially includes state institutions (courts, legislatures, bureaucracies) and state-enforced rules (constitutions, laws, regulations). While the informal implied personal networks, corruption, traditional culture, clientelism and civil society.

Helmke and Levitsky (2004: 731) explained how crafting of formal institutions differs markedly from informal rule-making processes. The formal rules assume written form of rules (political, economic, agreements and contracts) created through official channels (such as executives and legislatures) which are enforced by the state (courts and police). While the informal institutions according to North (1990) and Knight (1992), does not assume any written form but rather evolve spontaneously which is enforced beyond the public channels, in the form of social norms and customs, habits and customary laws. Because of the difference of how formal and informal rules are crafted, Helmke and Levitsky (2004: 731) pointed out the suggestions to examine the process of informal rule-making by identifying the actors, their coalitions, and interests largely behind the creation of informal rules, which is characterized by uneven distribution of power and resources (Knight 1992). Taking a cue from Knight (1992), they suggested that the underlying processes of such conflict ought to be brought to the forefront and examined, rather than assuming pure coordination.

When we talk about institutional change, we understand that institutions, in general, are dynamic in nature in that there are continuous emergence and evolution of new and old institutions. While formal institutions are consciously designed by individuals, most of the informal ones originate and evolve over time with little deliberation by individuals. Several reasons have been offered as to why institutions emerge or change. For example, Ostrom (1998) believes that groups of individuals consciously design new rules to overcome collective action dilemmas. Demsetz (1967) posits that different actors are continuously searching for cost-minimizing institutions. Whereas, according to Meyer (1995), formal institutions or political goods in some instances are exchanged for votes as a part of political process. Schmid (2004: 8) summarizes the multi-dimensional concept of institutional change. He explains the changes occurring in terms of increasing population, resources scarcity, technology advancement and people's subjective perception compels people's behavior and

interaction to change accordingly. When such behaviors and interactions are aggregated and regularized, new informal institutions emerge. Those behaviors may as well eventually result in pressure for formal institutional change.

The underlying question of 'how institutions emerge and change' has resulted in different theories from various disciplinary perspectives; each reflecting the respective empirical situations in which they aim to understand institutional change. In this regard, Allio et al. (1997) distinguishes between three types of institutional change namely, economic theories, public choice theories and the distributional theories of institutional change. First, the economic theories of institutional change take a neo-classical economic approach to explain and seek solutions for institutional innovation and change in order to reach a Pareto-efficient outcome in a competitive setting (Barzel, 1997; Demsetz, 1967; Eggertsson, 1990; Libecap, 1989). The second strand is the public choice theories of institutional change where the change occurs as a result of a process of exchange of institutions by political entrepreneurs in return for revenue and votes of the electorate (Allio et al., 1997). Both strands of theories explain the institutional change in situations where resources of power are symmetrically distributed amongst actors in a society. However, they fail to offer an explanation of institutional emergence, persistence and change in situations where these resources are asymmetrically distributed allowing inefficient institutions to thrive (Bardhan, 2005). Therefore, scholars such as Bates (1995), Knight (1992) Bardhan (2005) and Ostrom (2000) now assume that asymmetries of power lead to the emergence, and persistence of inefficient institutions. Knight (1992) analyzes institutional change from the perspective of distributional conflict theories, which assumes that each strategic actor in an action situation has different interests and endowed with different power; which positions actors to have conflicting interests. Therefore to resolve these conflicting interests, the actors undertake some strategies to find solutions according to power resources that they are endowed with. The actors who can control power resources (such as information, political access, and capital) tend to influence the process of institutional change and resolve conflicting interests by creating or changing to their favour, eventually satisfying the interests of individuals, rather than collective interests (Knight, 1992: 146).

Knight's (1992) distributional conflict theory of institutional change is a universal theory that attempts to explain institutional change at all institutional levels. This theory is applicable to

both formal and informal institutions, where institutions emerge as a result of strategic conflicts over distributive gains under conditions where power asymmetries exist. Changes in informal rules can be accomplished intentionally, because of difference in interests and asymmetries of power (Knight, 1992: 147). According to Knight (1995), changes in the distribution of power give self-interested actors an incentive to change their institutional setting toward one that favors their interest. Further discussion on the application of distributional theory to the study context is detailed in the following section.

3.4 Knight's Distributional Theory of Institutional Change and its Applicability to Hyderabad's Case

Whilst many theories explain resource conflict, Bues (2011) described the applicability of the distributive bargaining theory of institutional change. The term 'conflict' is contextualized to situations where disputes occur over existing and settled formal and informal institutions. According to Bues (2011: 21), conflict situations occur in the process of creating rules that are essentially characterized by a bargaining process (Knight 1992). As property rights distribute social outcomes, each strategic actor eventually seeks to achieve the best distributive outcome. Therefore conflicts are inevitable in process of rules creation over institutions which seek to distribute benefits. The other type of conflict situation occurs even after the rules are established. According to Knight (1992), on the one hand, the actors with the more powerful bargaining power will make a full endeavor to promote their interest of distributional goals; while on the other hand, the other group of actors, unhappy with the arrangement will try to rectify it. The process to change and rectify the rules will entail violations, individually or collectively, which will likely be resisted by the group of actors benefitting the current arrangement of rules (Knight, 1992: 59). In this sense, conflicts persist despite an agreed rule is established, which forms the theoretical basis of the research study, where water reallocation against the prescribed allocation guidelines have persisted in the ensuing conflict and competition for water between Hyderabad's urban need and the irrigation sector.

This study takes a cue from the work of Bues and Theesfeld (2012), where they asserted that analysis of land and water governance systems necessitates the inclusion of social and political dimensions. Their study on the characteristics of 'Water grabbing and role of power' draws primarily on the distributional theory of institutional change (Knight, 1992). This theory particularly provides good explanations of human interaction in the context of limited

resources and resulting resource conflicts (Acheson and Knight, 2000; Theesfeld, 2004). They employed the concept of power resources as the central analytical concept and draw on Theesfeld's work (2011) who conceptualized the institutional change in Bulgaria's water sector reform as a struggle among power-asymmetric actors.

In order to examine the limited water resources and the resulting resource conflicts in the case of Hyderabad's arbitrary water reallocation, Knight's distributive theory provides a good explanation of why institutional change and conflict persisted over time. Focusing on property rights as one form of institutions, Knight (1992: 107) describes institutions as a by-product of distributional conflict over substantive outcomes, where the process of creating institutions inherently manifests conflict. Whilst the actors with more bargaining power further their distributional goal, the other actors dissatisfied with the agreement will try to change it, which is apt to the Hyderabad's case study context of water conflict between the urban and the agricultural sector. Despite the water allocation rules already in place, arbitrary reallocations of water against the prescribed guidelines have persisted over the years, resulting in conflicts and competition between the two sectors. It may be interesting to note that Araral and Yu (2012: 7) pointed out the fact that studying water governance particularly conflicts in the allocation and use of property rights inherently involves a political dimension, yet not much attention has been laid on the politics of water governance in the existing literature. Therefore this study also attempts to empirically define the political dimension and the dynamics involved in such arbitrary reallocation by employing Knight's (1992) concept in understanding such resource conflicts.

In understanding the persistence of such rules-in-use despite the rules-in-form already in place in Hyderabad's context, Helmke and Levitsky (2004: 727) supported Knight's (1992) concept of power in the process of bargaining. They elaborated the stark contrast in the way informal institutions are created in the bargaining process, from the formal rule-making processes. How effective are those formal rules enforced, largely depends on informal institutions such as social attitude, norms, and pattern of interactions which individuals assume in any activity. It is important to understand and examine where informal institutions come from, and how they evolve or change to fully understand how the interaction between formal and informal institutions can be harnessed to lead to an outcome with desirable policy goals. Therefore, they suggested that research emphasis should essentially examine the process of informal

rule-making by primarily identifying the actors, coalitions, and interests behind the creation of informal rules.

Farrell and Heritier (2005: 277) also similarly argued that when informal rules are created, it is largely influenced by how the formal rules are interpreted, which they define as written rules of behavior subject to third-party dispute resolution. With the popular perception of the ambiguous characteristic of formal rules, based on their own interpretation, actors create informal rules guiding the daily application of these rules. Because of the ambiguous characteristic of these formal rules, actors will have different interests over the content of these rules, in particular when these rules effectively allocate differential decision-making weight. In such case, each actor obviously prefers those rules that maximize its own decision-making. Thus, they also suggest that the rule-making process is bound to entail conflict over how these common gains are allocated and distributed, rather than this rule-making process being characterized by common gains from co-ordination (Knight, 1992).

Hyderabad's water conflicts are also inclined towards the political influence and dynamics of water resource management and allocation. In this regard, Moe (2005: 215) gave an interesting insight on the conventional rational choice theory of political institutions, where the theory views political institutions as structures of voluntary cooperation which seeks to find solutions to collective action problems in a way to beneficial to all concerned parties. The rational choice theory emphasizes on cooperation and hardly speaks of power. Therefore, Moe (2005) argues the fact that the political process often gives rise to institutions that are good and beneficial for some people, contrary to being bad for others. It implies the power an individual or groups of people possess in order to exercise their will. He, therefore, stated that while institutions may be structures of cooperation, such political institutions may also be structures of power as well. Moe (2005: 224) further stated that while Levi (1998) and Bates (1989) brought the concept of power to the forefront, however, it was Knight (1992) who was the first to examine it systematically by propounding that institutions are mainly explained by distributional conflicts and power rather than collective benefits.

According to Kingston (2009: 163), in examining the role of distributional conflict in the process of institutional change, many scholars such as Libecap (1989) pointed out institutional change as a centralized political process. However, others such as Knight (1992)

opposed to being decentralized and spontaneous process. In the centralized process, the state specifies formal rules i.e. property rights and individuals and organizations in a bid to achieve maximum benefits, engage in conflict and bargaining and make full attempt to change these rules. In this process, different property rights arrangements entail different distributional consequences. Individuals and groups, therefore, make full endeavor in trying to change the rules that benefit them. This takes place either in private amongst themselves or the other channel of change would be to lobby the government. The contracting process whereby property rights rules alter and change is in turn generally governed by political rules arranged at higher levels.

However, this is markedly different from Knight's understanding of bargaining which is characterized as a decentralized and spontaneous process. Here, bargaining takes place at the level of the individual transaction rather than through a centralized political process. Over time, out of this decentralized process, a common convention may emerge. Here, if some kind of actors possesses greater bargaining power than others, Knight argues that this may systematically influence and affect the kind of rule that eventually becomes widely-used by the society in general. It is important to note that whilst the applicability of Knight's distribution theory pertains to consciously and unconsciously created institutions as well as for formal and informal institutions, his body of work, however, is largely directed on the spontaneous decentralized emergence of informal institutions. He argues that not much attention has been accorded to the role of distributional conflict for the explanation of the informal rule, norms, and conventions. Whereas, numerous studies have already been carried out on the role of distributional conflict in the creation of formal, social and political institutions by scholars such as Bates (1990), Libecap (1989) and North (1990). Further, Knight pointed out that the concept of power asymmetries as an explanation for the emergence and existence of informal rules in a society has largely been neglected, to which this study addresses.

Defining power, Knight (1992: 41) states that exercising power over someone or some group implies how it will affect by some means, the alternatives available to that person or group. In an interaction between actor A and B, If actor A has more alternatives or choice when a specific relationship breaks down between them, actor B will be considered less powerful than actor A. In other words, If B is found to possess far fewer alternatives, which eventually

positions actor A to exert credible threats to call in a bargaining process. According to Knight (1992: 126), social institutions are a result of one's own preference of alternatives, through concerted efforts which inherently constrains the strategies and alternatives of others. Interdependence of society makes it important to anticipate the actions of others for strategic actors, in order to make an assessment of what is best for them to do. The best way to constrain other actors' choices is, therefore, to affect their expectations about our own actions. Social institutions regularize these constraints, by providing information about the expected actions of others and thereby, constraining our choices. As mentioned earlier, Knight focuses specifically on the spontaneous emergence of informal institutions, where actors endowed with asymmetric resources essentially try to constrain one another's actions by influencing their expectations. Hence the 'asymmetries in power resources' is central to Knight's explanation. This theory propounds that asymmetries in resource ownership invariably affect the willingness of rational self-interested actors to accept the bargaining demands of other actors (Knight, 1995: 108).

It is always the powerful actor who compels the other actor to take actions that they would not otherwise choose to do themselves (Knight, 1992: 42). 'More powerful' here refers to resource ownership. Therefore the power to bargain is a consequence of the asymmetric distribution of power resources in the society, and eventually, bargaining power and resource ownership are regarded as the main determinants of institutional change (Schlüter, 2001: 89). In other words, the bargaining theory of institutional emergence and change that Knight (1992) explains essentially starts with the interactions between actors in society. Interactions offer the potential for mutual benefits for the participating actors. However, these benefits may be differentially distributed to the actors. By using the power that they bring to interactions, actors attempt to influence the outcome of interactions to benefit them.

Hence, asymmetries in bargaining power and resource ownership are central to the theory of bargaining and institutional change. Therefore the factors that create such asymmetries between actors and lead to a bargaining outcome in favour of one of the actors need to be identified and analyzed (Knight, 1995: 108). However, what kind of power needs to be possessed by strategic actors in order to influence institutional change or to create a new social institution has always been a question of concern. In this regard, several power resources have been identified as being important in the analysis of an actor's bargaining

power. Though originally devised by Knight (1992), these power resources have been further developed by Schlüter (2001) and Theesfeld (2005). The application of these power resources has been described by Bueus and Theesfeld (2012) in their work on ‘water grabbing and the role of power’ in Ethiopia.

An actor's ability to survive several rounds of the game without co-operating signifies 'power' in game theory. This could be due to his asset availability or the fact that he would bear relatively lower opportunity costs (Knight, 1992: 132). This power resource can be named exit costs (Schlüter, 2001: 91) which arise when bargaining essentially breaks down. Attitude toward risk and time preference is closely linked to exit costs. Risk behavior is closely linked to actor's resource availability. Knight (1992: 133) pointed out a positive relationship between ownership of resources and risk acceptance, on the other hand, a negative relationship between ownership and risk aversion. This allows an actor to withstand the duration or rather a several rounds of bargaining process as he would be less dependent on the bargaining outcome because he essentially possesses sufficient resources. Similarly, time preference represents another power resource, where actors with a lower time preference will have advantages in the bargain (Knight 1992: 135).

Credible commitment is another power resource. The crucial point is to convince a social actor to accept the commitment of another actor (Knight, 1995: 108-109). Credible commitment is a believable attitude demonstrated by actors that they will, in fact, do what they actually claim. In such a case actors with a good reputation will more easily be able to convince the other actors. With this power resource, an actor can determine the choice of other people (Knight, 1992: 175). Trustworthiness is closely linked to credible commitment and is one of the key power resources as highlighted by Knight (1992). Sanctioning is a mechanism that ensures commitment. In general, sanctions reduce the expected benefits of non-compliance and make compliance a more beneficial long-term strategy (Knight, 1992: 179). In other words, sanction power refers to the threat of sanctions imposed by one actor on the other in case there is non-compliance. This threat influences the bargaining situation of the threatened actor to the benefit of the threatening actor.

When there is a threat of sanctions for non-compliance, compliance to informal rules becomes a rational long-term strategy (Knight, 1992: 179). Information is considered to be key power

resources (Knight, 1992: 75), as information is crucial in order to compete. Strategic actors who seek to control information and are more aware of the expectation and strategy of those with whom they interact, and hence generally have a greater potential to win. Having an upper hand on the information they possess, they can potentially change an established institution or otherwise create a new one according to their advantage. As Knight (1992: 46) points out that information asymmetries are crucial in influencing actors' evaluations of individual alternatives, hiding institutional alternatives, or adding new alternatives.

Theesfeld (2011: 94) noted instances where imperfect information exists; education, experience or access to media and sources of information become important to be taken into consideration. Organizability of a group is another power resource (Knight, 1992: 197), where actors organize and act collectively, rather than in isolation or in a fragmented way in order to have a higher bargaining power. Schlüter (2001: 99) accentuated the importance of this factor equally at the local, informal level. The ability of group leaders to maintain discipline and unity and also to resolve the free-riding problem is crucial to enhance the groups' bargaining power (Knight, 1992: 197). Theesfeld (2005: 76) defines joint mental models as another form of power resource. This power resource considers norms and values that constrain the pool of possible alternative that actors have. Finally, there are networks and positional power, where networking provides members with information and thereby reduces transaction costs for specific interactions. Positional power refers to the assigned strategic position that allows for certain actions. For instance, access to important information, controlling power over assets or the opportunity to carry out credible threats (Shleifer and Treisman, 1998: 20) are characteristics of the positional power.

3.5 Inter-sectoral Water Reallocation and the 'Politicized' Institutional Analysis and Development (IAD) Framework

Hyderabad's inter-sectoral water contestation, conflict and competition with agriculture have been aggravated by persistent arbitrary water reallocations, against the administratively prescribed allocation guidelines over the years, with detrimental consequences for both the sectors. This study seeks to examine the persistence of rules-in-use, despite the rules-in-form already in place. The analytical framework adopted for this study is that of the Institutional Analysis and Development (IAD) framework (Ostrom, 1990; Ostrom et al., 1994). The framework not only assists in identifying the elements and associated relationships that should

be considered for institutional analysis (Ostrom, 2005) but also used to create a coherent structure for inquiry by identifying and organizing the general sets of variables of interest and their relationships to each other (Koontz, 2003).

In undertaking the study on policy analysis of the inter-sectoral water allocation in Hyderabad to understand ‘why a particular set of policy is giving a certain outcome’; the framework identifies three exogenous variables (biophysical attribute, attributes of community and rules-in-use). It guides us to analyze how these exogenous variables influence the role of institutions which shapes human interaction and decision-making process to eventually produce an outcome of such arbitrary water reallocations against the prescribed allocation guidelines. However, it may be noted that the study of water governance, particularly conflict in allocation and use of property rights amongst other, emerges as an essential component that is inherently a political subject, yet the politics of water governance continue to remain a black hole in the existing literature (Araral and Yu, 2012). This study, therefore adapts a 'politicized' IAD framework, adding the 'politico-economic' context as the fourth exogenous variable as illustrated by Clement (2010) in analyzing the natural resource governance in Vietnam. This fourth exogenous factor adapted in the IAD framework not only assists in identifying ‘political’ elements and associated relationships that should be considered for institutional analysis (Ostrom, 2005), but also used to create a coherent structure for inquiry to empirically define the dynamics of political influence as a ‘power resource’ in rural-urban water governance by taking the case study of Hyderabad.

The IAD framework identifies the action arena as the core unit of analysis, where actors undertake the process of informing themselves, based on which they consider alternative courses of action, take action based on their decision, and face the consequences of the actions that they take. The action arena has two elements. First, the action situation, and secondly the actors who interact in the action situation (Polski and Ostrom, 1999: 20). What goes on in the action arena are all affected by factors in the bio-physical world, the attributes of the community and the rules-in-use. In addition to these three factors, this study includes the fourth factor, i.e. the 'politico-economic context' as illustrated in Clement's (2010) politicized IAD framework. The political and economic factors influencing the behavior of actors in the action situation may be conceptualized by the ‘political-economic’ variable (Whaley and Weatherhead, 2014: 5). They asserted that an understanding of the local as well as the wider

political and economic situation is vital to understand the distribution of power among social actors. This serves as a good guide towards analysing the power dynamics and its influence on the behavior of individuals. How the biophysical conditions influence the action arena particularly depends on the substractability and exclusion of the resources. While other attributes of the resources such as their size, abundance, uncertainty (Wilson, 2002) or vulnerability (Ostrom, 2007) might also substantially affect their use. To ensure the effectiveness of the rules which have been laid down to govern the resources, it is vital for these rules to be compatible with the nature of that particular resources as well as its physical setting (Ostrom et al., 1994: 44). The attributes of the community which influence the action arena may depend on the shared value the community (Cleaver, 2000; Klooster, 2000; Mosse, 1997), level of trust within the community, its size (Agrawal and Goyal, 2001; Olson, 1965) as well as the heterogeneity among the community (Hong and Page, 2004). This attributes may also be influenced by the demographic set-up of the community, norms of behavior, homogeneity of preferences and also the distribution of resources. Pertaining to a policy action situation, the attributes to be considered are generally accepted norms about policy activities, the degree of common understanding potential participants share about activities in the policy area, and the extent to which potential participants values, beliefs, and preferences about policy-oriented strategies and outcomes are homogeneous (Polski and Ostrom, 1999: 13). It also includes relevant socio-economic factors (Ostrom et al., 1994: 45).

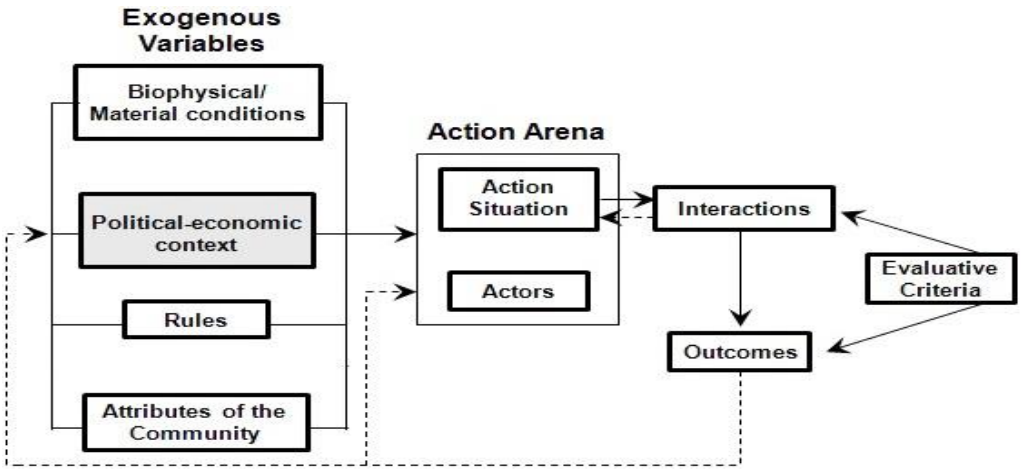

Figure 3-2: The 'Politicized' Institutional Analysis and Development (IAD) Framework

Source: adapted from Clement (2010), Ostrom (2007: 27)

How the 'political-economic context' influences and affects the action arena will depend on how the participants are positioned in the action situation. This variable helps us to identify the distribution of decision making power among various actors who essentially take decisions. When such a decision is taken, it focuses on how the political and economic interest influences such decision-making process, within the realms a particular set of rules-in-use (Clement, 2010: 137). How that rules-in-use affect the action arena involves an understanding of the formal and informal rules affecting the behavior in the action arena. Ostrom defines such rules-in-use as the shared understandings that generally refer to enforced prescriptions which define what kind of actions are required, prohibited or permitted (Ostrom, 1999: 50).

They may refer to both formal and informal prescriptions, for instance, legal documents issued by the governments and informal rules allowing interpreting these documents with relative freedom. The IAD framework prescribes seven types of rules (Polski and Ostrom, 1999: 16). They are position rules; specifying the set of positions that participants assume and their role in an action situation. Position rules also specify the number and type of participants who hold each position. Boundary rules specify which participants can enter or leave positions, more of an entry and exit rules and also how they do so. Authority rules stipulate the range of actions any participant in given position may undertake. Aggregation rules govern how decisions are essentially made in an action situation. Scope rules outline the jurisdiction of outcomes that can be affected. Information rules prescribe not only the type of information but also the amount of information that may be available to participants in an action arena. Finally, payoff rules regulate the costs and benefits in the action arena. The pattern of interaction is the result of the interaction of the exogenous variables affecting the action arena, which eventually lead to the outcomes. Once the characteristics of the biophysical and material world, community attributes, and rules-in-use are taken into consideration, patterns of interaction are seen to unfold logically as a result of the behavior of actors in the action arena (Ostrom et al., 1994; Polski and Ostrom, 1999: 24).

The last two components i.e. the outcome and evaluative criteria within the IAD framework are the results of all the components described above. Just as patterns of interaction logically flow from a rigorous IAD analysis, insights about outcomes flow logically from similarly well-founded observations about the pattern of interactions. When analysis of the outcome is

undertaken, it implies that the performance of the policy system is analyzed. Hence, some kind of objective standard or principle is needed for comparison. Sometimes, programs and policies provide these baselines. But in many cases, evaluative criteria must be specified as part of the policy analysis process, which the IAD identifies specifically in the political-economic analysis. This is generally employed to examine the outcome of policy implementation and also the performance of the policy. Operationalizing the politicized IAD framework to carry out the Hyderabad study context is detailed in chapter five.

4 Methodological Approach

4.1 Case Study as a Research Strategy

This section presents the rationality of employing the case study approach based on its applicability in carrying out institutional analysis and its ability to capture epistemological diversity (which may also be explained as the diversity of beliefs that people hold). It addresses the theoretical and philosophical underpinning concerning the nature of the case study approach. Thereon, it introduces an explicit explanation on what purpose a case study serves. Finally, from an epistemological point of view, it explains the place and contribution of the case study research pertaining to Hyderabad's study context. In order to examine institutions, Ostrom et al. (1994) suggested the necessity to understand how rules combine with the cultural and physical setting to generate diverse situations. A case study approach precisely allows for identifying the interrelatedness and inter-connected relationships and process of rules with the cultural and physical setting in a holistic manner. It involves the collation of information from a variety of sources, employing a variety of methods with a variety of data. Beckmann and Padmanabhan (2009: 343) also emphasized the case study approach as one of the most common ways to carry out an empirical institutional analysis. It investigates a contemporary phenomenon within its real-life context, especially when the boundaries between the phenomenon (i.e. arbitrary water reallocations) and the context (i.e. inter-sectoral water resource management) are not clearly evident (Yin, 1994). This research work employs the explanatory case study approach which ideally seeks to link an event with its effects and is suitable for investigating causality (Yin, 2003). The case study is a comprehensive research strategy or framework of design that comprises the logic of design, data collection techniques, and specific approaches to data analysis (Dufour and Fortin, 1992).

4.2 Research Paradigm and the Case Study

Based on the ontological perspective of how one perceives nature of reality, epistemology guides us about the appropriate ways of enquiring into the nature of reality. The research philosophy distinguishes two approaches; interpretive, and positivist, which differ fundamentally in their epistemological and ontological position. In reference to the study context of Hyderabad, to examine why arbitrary reallocations persist against the prescribed

allocation guidelines, there is ‘no single reality’ as different contexts have different realities. Therefore this study seeks to construct the reality to examine ‘how’ and ‘why’ such a phenomenon of ‘arbitrary reallocation’ occurs. This forms the basis of the ontological stance which guides our philosophy of reality. In order to acquire ‘reality’, this study employs the constructivist/interpretive paradigm approach where the ‘reality’ is constructed and interpreted which is grounded in the epistemological reflection that serves as a guiding theory of acquiring ‘reality’ or knowledge. According to Searle (1995: 28), the constructivist approach that involves data collection in form of interview, claims truth is relative and that it is dependent on one’s perspective which is built upon the foundation of a social construction of reality. It is important to note that this approach whilst acknowledging the importance of the subjective human creation of meaning, however, does not out rightly reject some notion of objectivity. The strength of this approach lies in the close collaboration that the researcher and the interviewee share in the process of communication. Here the interviewees describe their story and views of reality (Crabtree and Miller, 1999: 10), which allows the researcher to comprehend the interviewees’ actions (Robottom and Hart, 1993: 9). Since ‘all knowledge is relative to the interviewee’, in order to understand their points of view, the researcher works alongside to draw meaning and sense to eventually create their realities. The researcher then interprets these experiences in the context of their academic knowledge and experience and hence is inductive or theory building. Robert Stake (1995) and Robert Yin (2003) described two key approaches that guide case study methodology, based on a constructivist/Interpretive paradigm. Constructivists claim that truth is relative and that it is dependent on one’s perspective. Interpretive case studies are grounded in subjective understandings which provide a local explanation of the social phenomenon of interest. Therefore such case studies should seek to be explanatory, providing ways of understanding the social phenomenon. Eisenhardt (1989: 535) pointed out that in such interpretive approach, theories are employed. Accordingly, this study takes Knight’s distributional theory of institutional change to help create an initial theoretical approach to carrying out the empirical work.

4.3 Description and Rationale of Study Region Selected

Andhra Pradesh (Fig. 4-1) is situated in the southern part of the country. It is the 4th largest state in India with an area of about 0.275 million Sq.km. It lies between Latitudes 12º 37' N and 19º 54' N, and Longitudes 76º 46' E and 84º 46'

E. The climate of Andhra Pradesh is tropical in nature. The State receives about 66 percent of rainfall from south-west monsoon (June - September) and about 25 percent from northeast monsoon (October - December). The remaining 9 percent of the monsoon is received during winter and summer months. Data also indicated the prevailing recurrent droughts in certain parts of the State (Rao, 2009). The research study to analyze the factors for arbitrary reallocation of water against the prescribed guidelines between the city of Hyderabad and the agricultural sector was based on the empirical fieldwork undertaken in selected regions of Andhra Pradesh.

Firstly, this section described the two reservoirs (Singur reservoir across Godavari River and the Nagarjuna Sagar reservoir across Krishna River) relevant to the study context. These two reservoirs were principally meant for agricultural purposes but eventually ended up sharing water with the city of Hyderabad. Together, water from these two sources supplies almost 70 percent of the water to the city of Hyderabad. In addition, the irrigated catchment areas affected by water reallocation to the city are also highlighted. These catchment areas are subjected to the contestation of water with subsequent arbitrary water reallocations, which form the basis for site selection to carry out the empirical field work. Data has also been collected from key water-related actors in Hyderabad ranging from government agencies to non-governmental organizations and research institutes including the citizens of the city.

4.3.1 The Singur Reservoir and the Water Allocation Mechanism in Place

The Manjira River is a tributary of River Godavari that originates in the state of Maharashtra and flows through the three riparian states (Maharashtra, Karnataka and Andhra Pradesh). Water is shared between the three states as per the Godavari Waters Dispute Tribunal (also known as the Bachawat Tribunal, Government of India, 1979 and 1980). The Tribunal awarded Andhra Pradesh 65 TMC of water that was specifically meant to be allocated to

Nizamabad and Medak districts. However, since the Nizamsagar project (30TMC capacity) in Nizamabad district and Ghanpur dam (4 TMC) in Medak district were already in place, Andhra Pradesh was permitted to construct the 30 TMC capacity Singur project in 1975. Originally the Singur project was meant to serve as a balancing reservoir for the two irrigation projects, i.e. Nizamabad and Ghanpur anicuts (catchment area), and later to also supply drinking water to Hyderabad. In effect, 4 TMC of water was earmarked to meet the drinking water requirements of Hyderabad, as well as to generate 15 MW of power. In addition, a Government Order was issued in 1980 allocating water from the Singur project for irrigating 40,000 acres of en route villages in Medak and Nizamabad districts (Lakshmipathi, 2001). Water allocation guidelines from the Singur Dam to both the city and the irrigation projects were administratively sanctioned via two Government Orders (G.O.s) in 1989 and 1990. The government of Andhra Pradesh devised the operation rules for allocating water between the two sectors. It particularly placed priority to drinking water for the city over agricultural uses, as per condition set out by the World Bank to fund and undertake the urban water supply project. The first Government Order (G.O. 90) passed in 1989 specified volumes of water to be allocated to Hyderabad as well as to the Ghanpur and Nizamsagar irrigation projects.

Figure 4-1: Manjira River Originating in Maharashtra Passing Through Three Riparian States

Source: adapted from Celio (2007)

Annually Hyderabad was entitled to 197.1 Mm3 of water from Singur dam, whilst Nizamsagar irrigation scheme was entitled to 236.4 Mm3 and Ghanpur irrigation scheme to receive 115 Mm3 of water (The Andhra Pradesh Housing, Municipal Administration and Development (A2) Department, Government Order Ms No. 190, dated April 12, 1989). The other Government Order (G.O. 93) passed in 1990 put the operation rules of the Singur dam in place, particularly setting up the conditions as per the World Bank's insistence. Water was to be released to the agricultural sector only when the water level at the Singur Dam was above a prescribed level for each month. The prescribed levels were devised in such a way to ensure that the water stored in the Singur Dam was always sufficient to cover Hyderabad water needs (The Andhra Pradesh Irrigation and CAD Department, Government Order Ms No. 93, dated February 24, 1990). Celio and Giordano (2007) interestingly noted that since the inception of the Singur dam, even though Hyderabad had been given priority over agricultural uses, the two sectors have never met their amount allocated to their full potential. The city never received its allocated share because of the poor transmission system, whereas the irrigation sector never received its allocated share due to the high variability and uncertainty of the monsoon inflow into the Singur dam each year. Under such circumstances, the government of Andhra Pradesh was averse to the risk of providing Nizamsagar with its due share of water which would eventually reduce the storage in Singur dam. Celio (2009) stated that contestation for water from this source has been steadily increasing over the years.

Figure 4-2: Singur Dam, Medak Dist. Andhra Pradesh

Source: photo documentation, (Own) October 2011

Figure 4-3: Specification of the Singur Dam, Medak Dist. Andhra Pradesh

Source: photo documentation, (Own) October 2011

4.3.2 The Ghanpur and Nizamsagar Irrigation Projects

As mentioned in section 4.3.1, the Godavari Waters Dispute Tribunal allocated water to the three states. Andhra Pradesh was awarded 65 TMC of water that was specifically meant for Nizamabad and Medak districts. The Singur project was constructed in 1975 originally as a balancing reservoir for these two existing irrigation projects, i.e. Nizamabad and Ghanpur. The Ghanpur irrigation project was the first scheme constructed across Manjira River in 1904 at a cost of Rupees 18.00 Lakhs. Some years later, the left canal was added to increase the utility of the River. The ayacut (catchment area) of 17,308 acres was being irrigated under this Ghanpur irrigation project, which was subsequently increased to 30,000 acres. The villages under the catchment area of this irrigation project undertaken as study sites for data collection were Rampur, Chityal and Macharam.

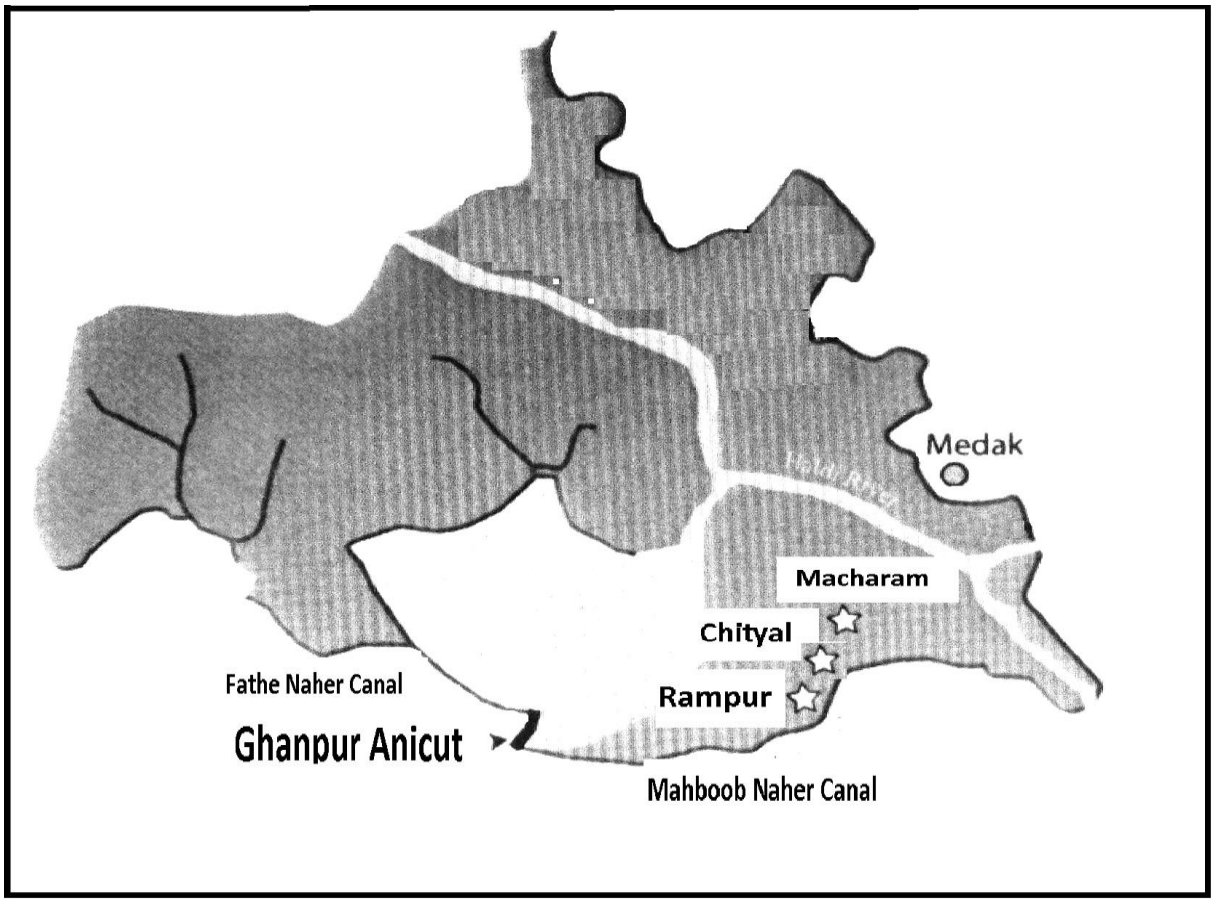

Figure 4-4: Catchment Area of the Ghanpur Irrigation Project

Source: Celio (2009)

The Nizamsagar irrigation project (Fig. 2-4) is the second irrigation scheme on Manjira River and the largest in the former Hyderabad state. It was taken up during the year 1923 and completed by the year 1931. The Nizamsagar irrigation scheme across the Manjira River was commissioned in the early 1900s by Osman Ali Khan, the seventh ruler of the erstwhile Hyderabad state. Nizamsagar is located in the Nizamabad District of Andhra Pradesh, around 100 km north-west of Hyderabad.

The project was originally designed to irrigate 111,375 hectares with its storage capacity of 821.2 Mm3 of water, but this decreased to 334.1 Mm3 by 1972 due to silt accumulation. The present reservoir capacity of 504 Mm3 was obtained by renovating the dam, and the average annual irrigated area is presently 67,965 ha (Celio 2007: 4). The catchment area of the Manjira River above Nizamsagar is 21,693 km^2. The villages under the catchment area of this irrigation project undertaken as study sites were Nizamabad and the surrounding villages.

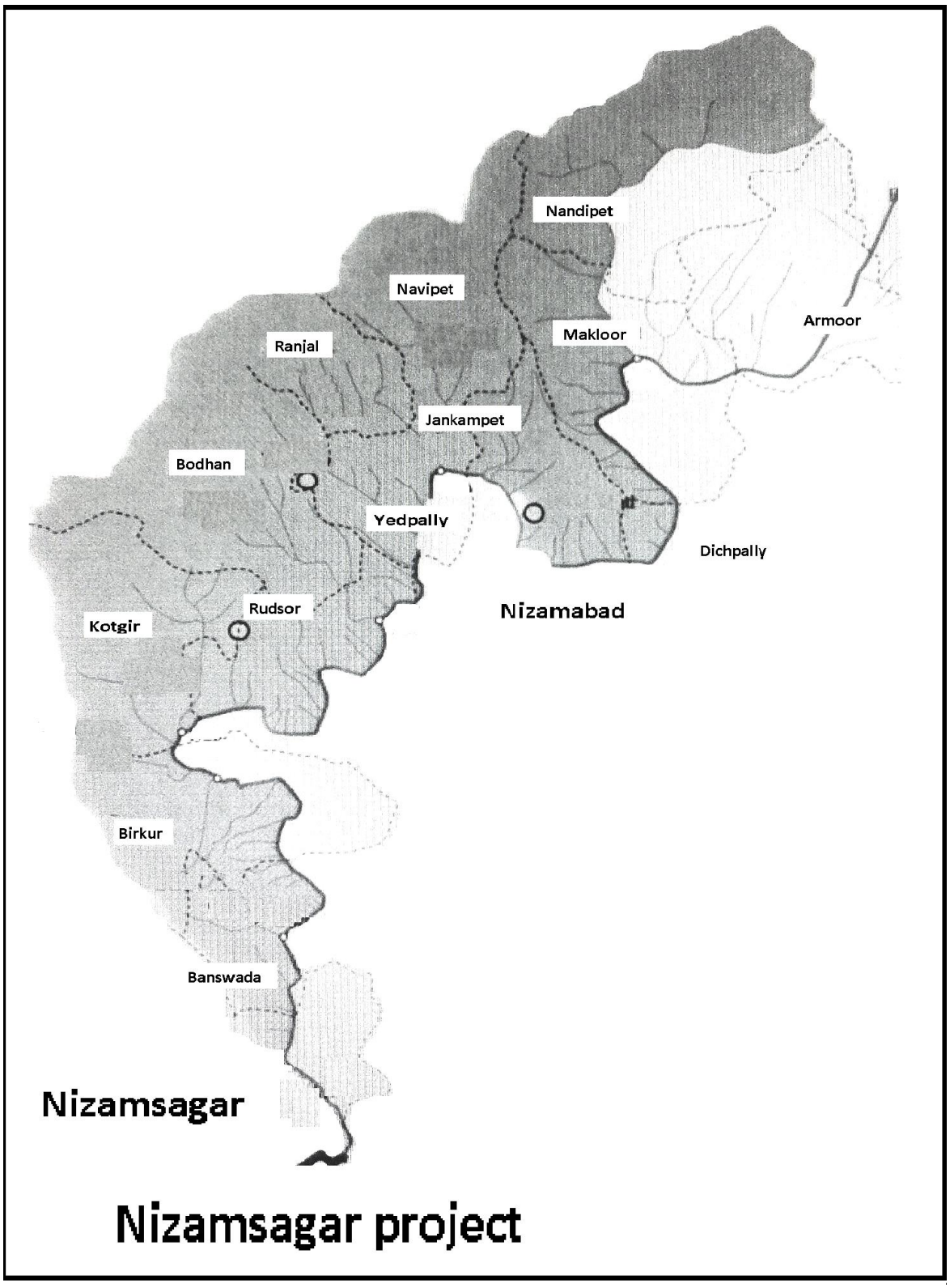

Figure 4-5: Catchment Area of the Nizamsagar Irrigation Project

Source: Celio (2009)

Figure 4-6: The Ghanpur Irrigation Project, Medak District

Source: photo documentation (Own) October 2011

Figure 4-7: The Nizamsagar Irrigation Project, Nizamabad District

Source: photo documentation (Own) October 2011

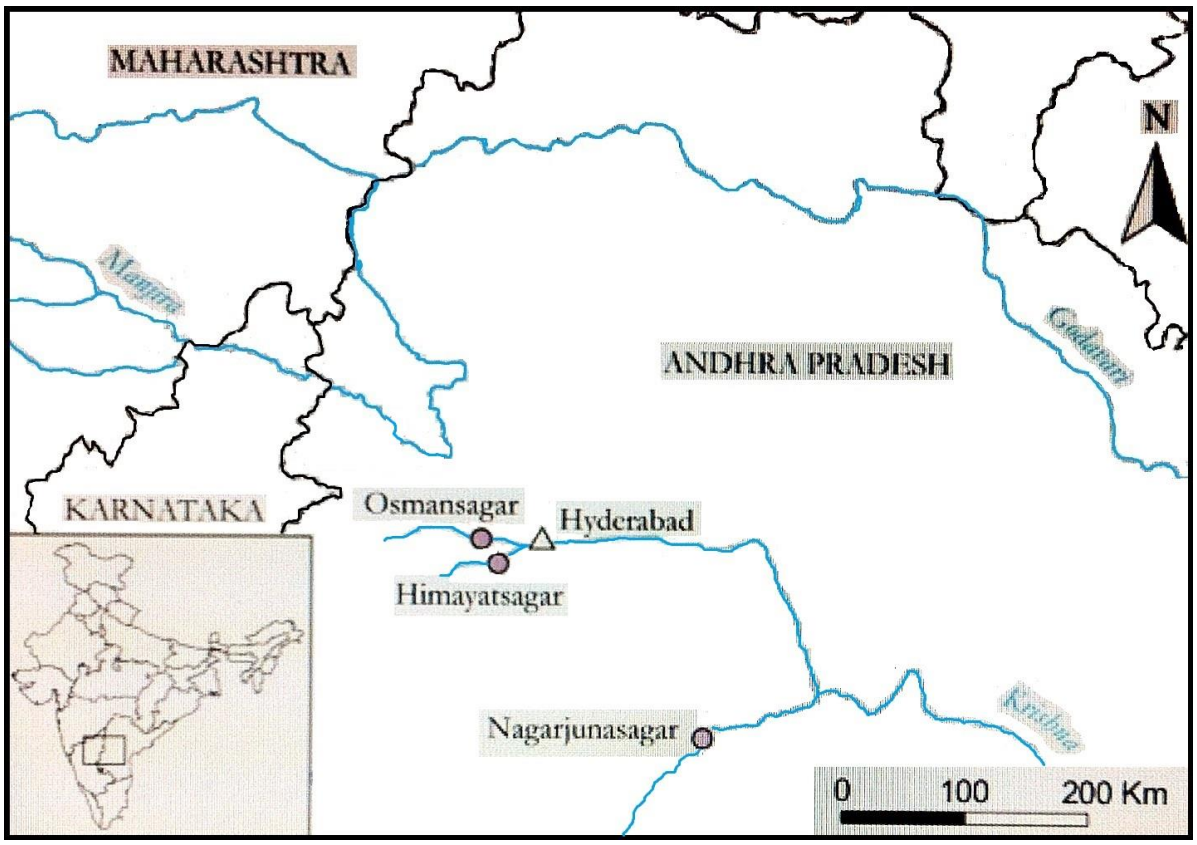

Figure 4-8: The Krishna River Supplying Water to Hyderabad

Source: adapted from Celio (2007)

4.3.3 The Nagarjuna Sagar Dam across River Krishna

The Nagarjuna Sagar dam serves as one of the primary irrigation and hydroelectric projects in Andhra Pradesh. Besides providing water for irrigation, the Nagarjuna Sagar reservoir also caters to the daily drinking water needs for Hyderabad. The two villages under the catchment area of this irrigation project taken as study sites are Mukundapuram village in Nidamanoor mandal and Yacharam in Peddavoora mandal. While increasing the water transfers from the Manjira source to Hyderabad, the Government of Andhra Pradesh in 1986 further appointed the Sri J. Raja Rao expert commission to submit alternatives for further augmenting the Hyderabad water supply from other sources.

The commission recommended drawing the required 467 Mm3 of water annually from Nagarjuna Sagar reservoir of the Krishna basin. This recommendation implied that water was

to be reallocated from the agricultural sector. It was based on the argument that priority had to be given to drinking water over irrigation, in accordance with the landmark report of the India Irrigation Commission (Government of India, 1972), as well as from the award of the Krishna River Disputes Tribunal accorded in 1976 (Government of India, 1976). The commission placing criteria for urban water priority further argued the justification of supplying water to Hyderabad city. People from all the districts and regions of the state live in the city of Hyderabad and therefore high priority was to be accorded on this account (Government of Andhra Pradesh, 1987).

However, the waters of Krishna River finally reached Hyderabad thirty-two years after the submission of the report of the Sreenivasa Rao Expert Committee. The current allocation of water from the Nagarjuna Sagar project on the Krishna River to Hyderabad is increasing. Water from this reservoir has traditionally been used for agriculture. The total allocation from River Krishna to the city is 16.5 TMC where 11 TMC of water is being drawn through Phase-I and II schemes (Krishna Drinking Water Supply Project, Water Allocations Government Order: G.O.Ms.No. 264, dated: 29-12-1997 G.O.Ms.No.70, dated: 4-5-2002 G.O.Ms.No.19, dated: 5-2-2003) and the remaining 5.5 TMC is expected to be drawn from Phase-III schemes, as already mentioned in as already explained in chapter 2, (section 2.4). Celio (2009) stated that the water transfers to Hyderabad have been vehemently contested and opposed in the water allocation out of Krishna River as the transfer has been mediated without rational compensation. Further, the transfer has been made across regions, notably from Rayalseema region, a comparatively backward and water scarce region to wealthy urban Hyderabad, against previous historical commitment and agreements.

4.4 Empirical Methods

Case study research allows the use of multiple data sources, which not only enhances data credibility (Patton, 1990; Yin, 2003) but also increases construct validity. The gist of using each data from multiple sources is to contribute towards the contextual understanding of the phenomenon to allow all the data to finally converge in the analysis process, adding strength to the final results (Yin, 1994). Primarily, six sources of evidence (i.e. documents, archival records, interviews, direct observation, participant observation, physical artefacts) in conducting case studies has been identified by Yin (1994) and Stake (1995). In conducting

any policy research, Bardach (2011) informs us that it is almost likely that all the sources of information and data will broadly be defined under two types; documents and people.

In the first phase of data collection, besides preliminary document analysis, interviews were conducted with water-related actors in Hyderabad, primarily government actors from the Irrigation Department and the Hyderabad Metropolitan Water Supply and Sewerage Board. In addition, interviews from Non-Governmental organizations and research institutes together constructed a platform of how the research should proceed to the next stage.

While document analysis and interviews were the main sources for data collection, other interactive empirical methods were applied such as field visits. Such visits involved a participatory approach with more interaction with the village inhabitants. The study also carried out narrative walks where people generally share their experiences in a storytelling format with the researcher. Here the farmers presented and explained their way of life that was deeply entrenched in agricultural activities and the related aspect of irrigation water and its availability and management. Photo documentation was additionally used to capture the agricultural and irrigation situation depicting the community way of life in general. In other words, the research study applied the methodological triangulation, which is simply the use of multiple sources of evidence (Yin, 1994: 90). It employed different methods to approach a particular research question which included interviews (open ended or structured), participant observation (direct or indirect) as well as document analysis (Stake, 1995: 114). Narrative walks were especially useful in further enabling the triangulation of data from interviews, documents, and in situ observation (Jerneck and Olsson, 2013).

To undertake the analysis, statements derived from relevant water-related documents (Annexure 2) together with statements derived from interviewed actors (Annexure 1) that framed their perception and their consequent actions were analyzed. An integrated analysis was carried out to examine the coherence of the policy content and provision within these water-related policies which likely manifested the phenomenon of water reallocation, which is observed in reality. Documents under review provided information and working rules on water resource allocation and management in the state of Andhra Pradesh.

4.4.1 Document Analysis

a Document analysis is a process in which the content of the document is interpreted to give a meaning of an assessment subject. Documents also provide background information and guides in designing the research project, for example prior to conducting interviews. While analyzing documents, it incorporates coding content into themes, in a similar way in which the interview transcripts are analyzed. Firstly the institutional change in terms of policy change and subsequent legislative changes were traced to throw light on organizational reforms and also identified the characteristics of the water governance arrangements.

This was followed by reviewing policy documents on water resources and urban development ministries, as well as regional and local government reports. Last but not the least, detailed development in the water sector pertaining to socio-economic and political development in the state was constructed and combined. Analysis of other types of relevant document such as minutes of meetings, presentations, memorandums, press releases, newspaper articles and scientific journals were critically undertaken. Therefore the first part of this research consisted of a desktop study by examining the following key documents pertaining to the water management, with a particular focus on inter-sectoral water aspect in the state of Andhra Pradesh:

1. National Water Policy of India, 1987
2. National Water Policy of India, 2012
3. Andhra Pradesh State Water Policy 2009
4. The Andhra Pradesh Water Resources Development Corporation Act 1997
5. The Andhra Pradesh Water Resources Regulatory Commission Act, 2009
6. Andhra Pradesh Farmers' Management of Irrigation Systems Act, 1997
7. Hyderabad Metropolitan Water Supply and Sewerage Act 1989
8. Andhra Pradesh Water, Land and Trees Act, 2002
9. The Andhra Pradesh Housing, Municipal Administration and Development (A2) Department, Government Order Ms No. 190, dated April 12, 1989
10. The Andhra Pradesh Irrigation and CAD (Irrgn. V) Department, Govern ment Order Ms No. 93, dated February 24, 1990
11. Krishna Drinking Water Supply Project, Water Allocations Government Order: G.O.Ms.No.264, dated: 29-12-1997 G.O.Ms.No.70, dated: 4-5- 2002 G.O.Ms.No.19,

dated: 5-2-2003.

12. Report of the Committee on drawing additional water to twin cities from Srisailam or Nagarjuna Sagar or other Projects, Hyderabad. 1973
13. Report of the Expert Committee on Augmentation of Drinking Water Supply to Twin Cities of Hyderabad and Secunderabad from Krishna/Godavari River, Hyderabad. 162-B-May 1987
14. Hyderabad Metropolitan Water Supply and Sewerage Board: Detailed Project Report of Augmenting Water Supply to Twin Cities of Hyderabad and Secunderabad from Nagarjuna Sagar Foreshore Near L.B. Canal regulator. January 1991

In addition to the above key documents, the desktop part of the study also included a review of the wider water and natural resources legislative framework as well as baseline information and background reports primarily used for documenting the inter-sectoral competition and reallocation of water in Andhra Pradesh.

4.4.2 Interviews

Interviews were carried out in the selected areas to record perception on water issues pertaining to the competition between the city and agriculture. There were primarily two categories of water-related actors. One, in the city of Hyderabad mostly confining to water-related actors in the administrative set up of state water departments; the Irrigation Department and the Hyderabad Metropolitan Water Supply and Sewerage Board. The second category of water-related actors was mostly confined to farmers in the agricultural sector, affected by such urban water transfers. Besides these two main categories of water-related actors, others from non-governmental organizations and research institutes were also included.

Whilst the document analysis sheds light on the desired policy goals and implementation, interview sheds light on the actual situation on the ground and reveals perception, based on which they undertake specific actions. The study employed the semi-structured interviews which are commonly used in qualitative research (Dawson, 2002: 33). In this type of interview, the researcher establishes a set of questions to know more information about specific issues on the phenomenon under investigation. Thereafter it sometimes identifies new issues. Here the researcher is allowed to be flexible where questions could be added or

removed from the scheduled questionnaire. However, it is important to note that the level of awareness and the emotional state of the interviewee in the process of the interview may have considerable influence on the outcome. This may lead to the possible distortion of the data (Patton, 1990). The list of water-related actors as participants in the research study is included in Annexure No 2.

Three stages of fieldwork were carried out. The first stage was the exploratory field work which was conducted in 2010 for a period of 2 months (from September to October) to construct an overview and gain familiarity with the case to further identify and refine the area of research, develop the research question and identify relevant and specific actors to conduct interviews. The exploratory field work was carried out to validate the research concept and previous finding of water reallocation and its effects on agricultural activity, essentially seeking to answer the questions. Who is involved? What is the conflict? What is the situation on the ground? Who are the players? Who has decision-making power? How are the reservoirs governed? Based on these findings, key actors and stakeholders were further identified for key informant interviews. The outcome of the exploratory field work narrowed the focus of the research and clearly outlined the second stage of field work to conduct the interviews and further focus on specific policy document and academic literature.

The second stage of interviews was conducted in two phases between the years 2011 to 2012. The first phase was carried out from October 18 to December 15, 2011, and the second from January 15 to February 15, 2012. The water-related actors interviewed were from a wide range of governmental to non-governmental organization, academia, research institutes and civil society mostly based in the city of Hyderabad. Here, interviews were conducted based on the respondent's availability and willingness to discuss water-related issues. All interviews undertaken in the city of Hyderabad were conducted in English in a structured open-ended format.

In May 2013, the final stage of field work in Andhra Pradesh was carried out for one month (May-June), as the research study required further probing. The site selected was under the catchment area of the irrigation project which was being affected as a result of reallocating water to the city of Hyderabad. The villages in the command area of the irrigation projects of Ghanpur and Nizamsagar were situated some 90 km west of Hyderabad.

Figure 4-9: Interview with District Level Irrigation Officials and Farmers, Ghanpur Village, Medak District, Andhra Pradesh

Source: photo documentation, (Own) October 2013

Figure 4-10: Interview with Farmers, Ghanpur Village, Medak District.

Source: photo documentation, (Own) October 2013

The villages in the catchment area which were affected as a result of reallocating Krishna water to the city was approximately 120 km south of Hyderabad. In-situ observations were intensively carried in all the irrigation projects sites (Ghanpur, Nizamsagar and Srisailam Sagar) and villages under the catchment areas affected, to construct and understand the on-ground situation. All the interviews (Fig. 4-9 and Fig. 4-10) were conducted in a structured open-ended format through a translator (Mr Rao) who was fluent in Telugu, Hindi, and English. The translator being a retired bank manager in the district helped gain access to interview farmers willingly with the approval of the village Headman. The data analysis was based on information about their perception on water issues ranging from access to use, the sufficiency of water supply, agricultural activity and livelihood, adaptation mechanisms during water scarcity, and ways and means through which they eventually sought means to gain access to water through their social and political network.

4.4.3 Qualitative Data Analysis: Mayrings's Content Analysis Approach

Content analysis is a method of analysing written, verbal or visual communication messages (Cole, 1988) aiming to attain condensed description of the phenomenon (Kyngas and Vanhanen, 1999: 4). This can basically be any kind of recorded communication, i.e. transcripts of interviews/discourses, protocols of observation, videotapes, and written documents in general. With the whole idea of aiming to attain condensed description of the phenomenon, content analysis essentially distills words into fewer content-related categories, and it is assumed that when it is generally classified into the same categories, words, phrases, they tend to share the same meaning (Cavanagh, 1997). The purpose of creating categories is not simply bringing together observations that are similar or related (Dey, 2003) but to provide a means of describing the phenomenon, to increase understanding of such phenomenon and to eventually generate knowledge (Cavanagh, 1997). Miles and Huberman (1994) define qualitative data analysis as consisting of three components that form a concurrent flow of activities; Data reduction, data display, and conclusion drawing and display. Data reduction refers to focusing, simplifying and selecting the relevant data that is collected from the field notes. In other words, it organizes and sharpens the data. Data display organizes and compresses information. The final component of activity involves drawing a conclusion and thereafter verifying it, which is an iterative process that must be undertaken simultaneously during the field work. The analytical methods employed for this study is

loosely categorized in reference to Miles and Huberman's (1994) three components of data analysis, which is embedded in Mayring's approach of qualitative content analysis. Mayring (2000: 2) defines qualitative content as an empirical approach that avoids rash quantification and rather follows content analytic rules and step by step models, to methodologically control the analysis of texts within their context of communication.

There are three main phases for both inductive and deductive analysis processes; preparation, organizing and reporting. This study adopted the inductive category building approach and developed categories from empirical content. It followed an iterative process while categories were adapted according to the empirical content. It began with the preparation phase where the researcher makes sense of the data and to comprehend 'what is going on' (Morse and Field, 1995: 126) and obtain a sense of the context in a holistic way (Tesch, 1990). According to Dey (2003), the data should shed light on questions to make sense of who is telling? What is happening? Where is this happening? When did it happen? And why? All of these questions emerge when the written material is read through several times (Burnard, 1991; Polit and Beck, 2004). Only after the familiarity with the data sets, it begins to shed some insights on theories (Polit and Beck, 2004). Next is the organizing phase. Central to the inductive approach of category development is to formulate a criterion of definition derived from the theoretical context and the formulated research question, which determines the aspects of the textual material taken into account.

As already mentioned, creating categories is not simply bringing together observations that are similar or related (Dey, 2003) but it provides a means of describing the phenomenon thereby increasing our understanding to eventually generate knowledge (Cavanagh, 1997). Thereafter the text materials are worked through and categories were deduced carefully in a step by step process. Within a feedback loop, the categories are periodically revised. Eventually, these categories are reduced to main categories and finally checked in respect to their reliability (Mayring, 2000). The final phase is reporting, which involves the process of abstraction where formulating a general description of the research context through generating categories takes place (Burnard, 1996; Polit and Beck, 2004). Here each category is named using content-characteristic words. Subcategories with similar events and incidents are meticulously grouped together as categories and categories are further grouped as main

categories (Dey, 2003; Kyngas and Vanhanen, 1999). The process of abstraction is undertaken as far as is logical, reasonable and possible.

5 Arbitrary Water Reallocation in Hyderabad

Overview

This study adapts Prager's (2010) operationalization of Hagedorn's (2008) Institutions of Sustainability (IOS) Framework where she unpacks the action arenas into concise research steps. The analysis starts with the two central elements, actors and policies. It may be noted that Prager makes a concise effort to reflect Ostrom's seven variables in the research steps conducted for the actor and policy analysis.

Firstly for the actor analysis, water-related actors are needed to be identified; i.e. who are the actors? This is followed by describing the positions of the most relevant actors. Actors are classified according to groups of actors representing the organization they belong to, the administrative level they act at and what role they play in policy implementation, i.e. what are their positions? Secondly, information on the actors' characteristics such as interests, knowledge, capacities, resources and networks is to be analyzed, i.e. what are their physical and personal characteristics? Thirdly, actor's attitude and perception of water resources and the current state of inter-sectoral water allocation and management are examined. This step can reveal the actors' perceptions, e.g. the value they place on water resources, their perception of the severity of water scarcity and their perception of policy measures in terms of their effectiveness and costs and benefits. In other words, actors' perceptions and values essentially determine their objectives to undertake strategies to secure water for themselves. Finally, the resulting behavior and action in the action arena are analyzed. Here it is important to examine how the characteristics of each exogenous variable (such as the biophysical attribute, the community attribute, the institutional and the political-economic attribute) may exert influence on several elements of the action situation in the action arena. This is followed by examining the kind of interaction amongst participants that are generated to eventually reveal an outcome of water being contested between the two sectors and on numerous occasions and water being re-allocated to the agriculture sector against the prescribed water allocation guidelines. The following sections operationalize the IAD framework as described.

The specific policy issue that the study addresses is Hyderabad's inter-sectoral water conflict with the agricultural sector. Water allocations between these two competing sectors are

administratively prescribed with allocation guidelines in place. However, arbitrary reallocation of water against the prescribed guideline has been persisting over the years with detrimental consequences for both the sector. In this light, this study seeks to examine the institutional context of the 'water allocation mechanism' in place. It aims to further examine the underlying process of the interplay of water-related actors and rules and dynamics of factors which eventually propagates such arbitrary water reallocations. In undertaking the study on policy analysis to understand 'why a particular set of policy is giving a certain outcome', the framework identifies four exogenous variables (biophysical attribute, attributes of community, political-economic context and rules-in-use) and gives a good guidelines to analyze how these exogenous variables influences the role of institutions which shapes human interaction and decision-making process, to eventually produce an outcome of such arbitrary water reallocations against the prescribed water allocation guidelines.

5.1 Biophysical Setting

Biophysical attributes and material conditions determine and shape the physically possible actions, the outcomes that can possibly be produced, how actions may be linked to outcomes, and the set of information that the actors may possess (Ostrom 2005: 22). Acheson (2011: 330) points out the biophysical condition affecting the action arena which Ostrom describes, particularly depends on two key attributes of the resources. First, excludability, which characterizes the degree to which consumption of resources can be regulated and controlled. Second, subtractability, which characterizes the degree to which one person's consumption of resources will eventually reduce or deplete the availability of resources to others (Polski and Ostrom, 1999: 10). In addition, the other attributes of the resources which might greatly affect their use may be their size, abundance, uncertainty (Wilson, 2002), resilience or vulnerability (Ostrom, 2007). The characteristics of physical as well as material conditions can have a significant influence on policy action situations as well as constrain institutional arrangements. It is, therefore, important to specify these conditions because it can have substantial implications for policy design as well as collective action and politics, which needs to be critically considered in the process of any policy analysis (Polski and Ostrom, 1999: 10). The nature of the resources considered is an essential factor for the design of appropriate institutional arrangements linked to outcomes, defining resource access and use

(Ostrom et al., 1994). According to Mc Ginnis (2011), the IAD framework incorporates distinctions among four different types of goods and services which was introduced by V. Ostrom and Ostrom (1977) viz. private good, public good, toll good, and common pool resources. The resource under review will be contextualized as a common pool resource, which is determined by the attribute of the high cost of excludability and subtractability.

In the context of Hyderabad's case study, the following section describes the characteristics of the biophysical conditions and its influence on the action arena. Firstly, with the onset of urbanization in Hyderabad, the city started seeking water from the two reservoir sources namely Singur and Nagarjuna Sagar. These two reservoirs were originally meant for agricultural purposes, which later were diverted to the city with water allocation mechanism in place between the two sectors. However with the rapid pace of urbanization, the city's need for water exponentially increased, and it eventually drew more water from these two reservoirs. It stretched beyond the capacity of the two reservoirs to the point where allocation rules in place have been broken, and arbitrary reallocation of water has occurred over the years. While drawing water away from the agriculture sources has always been contested since the inception of such inter-sectoral allocation mechanisms, however, conflicts have increased as more water was gradually transferred. Secondly, bad monsoon and erratic rainfall in the state has greatly influenced the water availability in these two reservoirs. This has invariably triggered competition and conflict of water resources amongst users, eventually influencing such arbitrary water reallocations in the action arena over the years.

5.1.1 Attributes of Urbanization and its Influence on Water Reallocation

Celio and Giordano (2007) articulated the increasing urbanization of Hyderabad which had prompted water withdrawal from the two reservoirs across the Godavari and Krishna Rivers, originally meant for agriculture. The population of Hyderabad was estimated approximately 7 million. It has seen an average growth rate of 8.73 percent per year (Government of Andhra Pradesh and Centre for Economic and Social Studies, 2008). The current population growth rate of Hyderabad is 27 percent per decade, at which rate the population by the year 2015 will be approximately 10.5 million. Hence with this rapid pace of population growth and economic development, the city eventually increased its water demand as well. Reckien et al.

(2011) stated that the provision of adequate amounts of safe water has not been able to keep up with the continuing growth rate of the city.

As early as 1965, Hyderabad started withdrawing water from the Manjira reservoir across River Manjira, a tributary of River Godavari. As the city grew exponentially, this source was insufficient to meet the growing demand of the city. Consequently Singur dam was further constructed across River Manjira in 1990. Consistent with the agreements of the Bachawat Tribunal, the construction of the Singur reservoir with a storage capacity of 850 Mm3 was commissioned. The system to convey the water to Hyderabad was completed in two phases, one in 1991 and the other in 1993 (Government of Andhra Pradesh, 2005). In the allocation from the Manjira River, the primary allocation issue was between Hyderabad, and Ghanpur and Nizamsagar irrigation projects. The issue was addressed by allocation 'rights' through the Government Order (G.O. 90). This G.O. stipulated water entitlement to Hyderabad at 197 Mm3 annually and 352 Mm3 annually for Ghanpur and Nizamsagar irrigation projects.

It may, however, be noted that the G.O. gave priority to drinking water for Hyderabad. The G.O. clearly stated that water would not be allocated to the agricultural sector when water in the reservoir falls below a prescribed level. Below this prescribed level, water should be reserved only for Hyderabad's drinking needs. However, over the years it has been recorded that water has been released to the agricultural sector (both Ghanpur and Nizamsagar irrigation project) even though the water levels in the Singur reservoir were well below the minimum prescribed level in the G.O.

In the case of transferring Krishna River to Hyderabad, the Government of Andhra Pradesh in 1986 appointed the Sri J. Raja Rao Expert Commission. This Commission was asked to submit technically and economically sound alternatives for further augmenting the Hyderabad water supply from other sources. In its final report, the Commission recommended drawing the required 467 Mm3 of water annually from Nagarjuna Sagar reservoir of the Krishna River. Even though this required a reallocation from the agricultural sector, the Commission pointed out that priority had to be given to drinking water over irrigation. The justification of placing priority on drinking water was based on a landmark report of the Indian Irrigation Commission that was issued some years earlier (Government of India, 1972), as well as from the award of the Krishna River Disputes Tribunal given in 1976 (Government of India, 1976).

Moreover, the Commission asserted that the water supply to Hyderabad city was justified because people belonging to all the districts of the state were living in Hyderabad (Government of Andhra Pradesh, 1987). The current allocation of water from the Nagarjuna Sagar project on the Krishna River to Hyderabad is increasing. Water from this reservoir has traditionally been used for agriculture. The total allocation from River Krishna is 16.5 TMC where 11 TMC of water is being drawn through Phase-I and II schemes as indicated in Table 2-1. The remaining 5.5 TMC is expected to be drawn from Phase-III schemes as already explained in chapter 2, section 2.4.

Celio and Giordano (2007) suggested that a number of such arbitrary reallocations of water to the agricultural sector seem to have been determined by numerous factors. They noted key factors such as such as political pressures on the State Government, or by public representatives of farmers in both the Nizamsagar and Ghanpur command area or by electoral politics.

5.1.2 Attributes of Weather Variability and its Influence on Water Reallocation

The climate and the rainfall pattern in the study context is an essential attribute to highlight because it influences the water availability in the reservoirs. The water availability in the reservoirs eventually influences the competition, conflict and reallocation of water resources amongst users and uses in the action situation. In general, the climate in Andhra Pradesh is predominantly semi-arid. It experiences a hot and dry summer season from March to June, a monsoon season from July to September, and a dry winter extending from October to February. Droughts and water scarcity in summer months are a recurrent phenomenon in these semi-arid zones. Rainfall is unevenly distributed over the state and varies significantly from year to year. The annual rainfall of the State is normally 925 mm. Both the South-West monsoons (contributing about 68.5 per cent of the rainfall) and North-East monsoons (contributing about 22.3 per cent) influence the rainfall pattern. While the summer and winter, months receive the remaining 9.2 percent of the rainfall.

Looking into the pattern of the rainfall distribution in the geographical area of the state, the coastal area precipitation ranges from 850 to 1,000 mm (Venot, 2008: 2), while the south-west area is drought prone and receives only 450 to 600 mm of rainfall annually (Biggs, 2005). Rainfall variability is very significant in South India which is well exemplified by the

fact that Andhra Pradesh has recurrently requested financial assistance from the Central Government for drought as well as for flood disasters. Uncertainty in rainfall puts a great pressure on those farmers who depend exclusively on surface waters. While exploiting groundwater through bore wells has been the commonly adopted strategy for coping with drought. Nevertheless, as groundwater resources are becoming overexploited (Shah et al., 2003) and boring wells in hard rock aquifers entails a high risk of failure, groundwater has not been a sustainable option for coping with rainfalls variability. The influence of rainfall variability on competition, conflict and reallocation of water has been highlighted by Celio (2009). He pointed out that during years with high rainfall, for instance between 1998-1999, 1999-2000, and 2000-2001, the inflow in the Nizamsagar irrigation project (which receives water from the Singur dam) was sufficient to fill up the 504 Mm3 Nizamsagar reservoirs. The canal water use exceeded the maximum reservoir capacity. In such cases, the water reallocation to Hyderabad had no impact on agriculture. Conversely, when the annual rainfall over the Manjira basin was low, the transfer had the effects of inducing canal water scarcity and thereby restricting its use for irrigation. This prompted the competition and conflict for water resources between the two sectors. These inter-sectoral conflicts can be seen in particular during the year 2001-2002 and 2003-2004.

5.2 Attributes of the Community (Participants and Water Use)

How the attributes of the community affect the action arena depends on the shared values or 'culture' of the community (Cleaver, 2000), level of common understanding or trust within the community, its size (Agrawal and Goyal, 2001; Olson, 1965) and heterogeneity (Hong and Page, 2004). The attributes of a community may influence and affect a policy action situation because of their demographic set-up and their norms and perceptions about policy activities in question. Their values and preferences about policy-oriented approaches will largely depend on of the degree of a shared common understanding within the community (Polski and Ostrom, 1999: 13).

This section reviews the physical and cultural characteristics of each group of water users and water-related actors (government and associated actors, politicians, farmers and urban actors) involved in the study context of inter-sectoral reallocation. Based on their interest, this study attempts to examine what is their influence and participation in the process of such arbitrary

reallocation in the action arena? The attributes of the community which can facilitate the stakeholders to self-organise may be influenced by their age and gender as well as their race and size of the group. How collective action may be influenced by the size of the group or how the power relations and levels of trust may be influenced by gender and race. Further, the cultural attributes of the community which is characterized by their beliefs, norms and values construct the community's perception of the world around them (Whaley and Weatherhead, 2014: 7). The positions of the water-related actors are particularly established through the various reforms adopted and enacted over the years. This is described in the following sub-sections and the overall actor-interaction is diagrammatically represented in Figure 5-1.

5.2.1 Government and Associated Actors (Bureaucratic and Political Actor)

In this group of actors, the study focuses on two key government departments involved in the inter-sectoral allocation and management of water resources in Andhra Pradesh with divergent interests. The Department of Irrigation and Command Area Development (ICAD) has the interest to provide sufficient irrigation waters to agricultural farmers to meet their crop requirements. The ICAD Department is responsible for irrigation for agriculture in the state of Andhra Pradesh. It organizes and manages to provide irrigation water to agricultural crops through its systems such as reservoirs, canals and other irrigation infrastructure. While the Hyderabad Metropolitan Water Supply and Sewerage Board (HMWSSB) has the interest to ensure Hyderabad urban users with sufficient water supply. The Board is essentially responsible for all aspects of design, construction, implementation, planning, maintenance and operation of the city's water supply.

There are two key attributes that exacerbate the divergent interest of both the Irrigation Department and the Water Board. Firstly, HMWSSB is supposed to have overall control over its five water supply sources and its infrastructure. However, the two key water sources (Singur reservoir and the Nagarjuna reservoir supplying almost 70 percent of the water to the city) are under the control of the Irrigation Department with a water sharing mechanism in place. This has been the basis of protracted contention between the two departments. Celio (2007) suggested that as a result of such an administrative setup, it has further manifested internal struggles between the two department which further characterises the competition and conflict between the two sectors.

The second important attribute is the positioning of the political actors in the aspect of water resource management, which has been embedded in the various water reforms introduced in the state. The Constitution of the HMWSSB was crafted with the core purpose to empower the Water Board with financial autonomy to operate independently without political interference. However, the Constitution also has a provision for the Chief Minister of Andhra Pradesh to serve as the chairman of the Board of Directors of the Water Board, which accentuates the position of political actors and explicitly diminishes the independence of the Water Board from political interference. The Singur reservoir operated by the Irrigation Department releases water to Ghanpur and Nizamsagar for irrigation purposes after being jointly agreed upon by the Principal Secretary for Irrigation and the Managing Director of the HMWSSB, based on the dam operation rules of water allocation for Hyderabad and for agriculture. However, in the case of disagreement between the Principal Secretary and Managing Director, the Chief Minister takes a final decision on the matter. This interesting interplay between these actors is analyzed in the next chapter.

5.2.2 Rural Water Actors (Farming Community - Water User Association)

Andhra Pradesh has about 72 percent (approx. 30 million) of the population living in the rural areas, with 62 percent of them sustaining their livelihood primarily on agriculture and related activities (Reddy, 2011: 394). The land ownership pattern is similar to the rest of the country. About 80 percent of the land is largely owned by few rich farmers. While about 80 percent of the farmers cultivate the remaining 20 percent of the land. These poor and marginal farmers are often characterized by their size of fragmented land holdings which is usually below 1 hectare which is due to the further division of land on inheritance. Typically, this land is of poor soil quality and has insufficient access to water. Farmers cultivate only one rain-fed crop a year, which is also known as Kharif seasoned crop (James and Robinson, 2001). Agriculture in Andhra Pradesh continues to remain the mainstay of the rural economy supporting the largest proportion of people, providing the largest share of total income for their livelihood. Besides supporting the rural economy and livelihood, the agriculture sector contributed 23.1 percent to the Gross State Domestic Product (GSDP) in Andhra Pradesh (Government of Andhra Pradesh, 2013). This places irrigation as the primary source of agricultural growth in Andhra Pradesh. However, despite major investments in the irrigation sector by the Government, irrigation systems were characterized by low efficiency. This was mainly due to

lack of established operation and maintenance procedures. Further, damages were caused by farmers seeking additional water or timely water deliveries by tampering with irrigation structures. As a result, to bring about a reform in the irrigation sector, the Andhra Pradesh Farmers Management of Irrigation Systems (APFMIS) Act of 1997 was put in place (Peter, 2002: 12). The APFMIS Act was intended to reduce the role of government in the direct management of irrigation systems and made way to provide the framework for setting up Water User Associations (WUA). The constitution of Water User Associations characterizes and fundamentally maps the social and structural cohesion of the farming community.

This made provision for farmers' participation in the management of the irrigated water, as a result of which new leadership roles have emerged. In total, 10,292 Water Users Associations have been formed for major, medium and minor irrigation system through democratic elections. The main functions of these associations were to undertake management such as repairs and rehabilitation of the canal, oversee water distribution, manage internal conflict and disputes among the members and Water User Association, operation and maintenance work and also collect water tax to raise revenue for self-sustenance of these associations. In addition, they provide support to the Irrigation Department in monitoring water flow as well as assist the department in the process of preparing water demand and water tax (Badatya and Mohapatra, 2010).

The term Farmer Organization (FO) covers different types of organizations, namely the Water User Association (WUA), Distributary Committee (DC), and the Project Committee (PC). Water User Association is the primary body. For the purposes of setting up Water Users Associations, the Act further classifies the irrigation projects as minor (less than 2,000 hectares), medium (2,000 to 10,000 hectares), and major (more than 10,000 hectares). The Act divides the area of operation of a WUA into four to ten which is determined hydrologically rather than on boundaries, to ensure fair representation of all farmers in the WUA. This hydrological determination rather than on boundaries, according to the World Bank, proves to be more efficient and equitable (Raju, 2000).

The managing committee of a WUA comprises of a President and four to ten territorial constituency members. Elections for the WUAs are conducted through a democratic process of secret ballots, similar to the election procedure of the *Gram Panchayat* election. Here each

farmer has a vote irrespective of the size of their landholding which levels out the representation of large and small farmers (Madhav, 2007). As per the Act, the management committee meet as and when necessary. Two general body meetings (GBM) are held annually; one each before starting of the Kharif and the Rabi seasons. In these meetings, important decisions regarding crops to be grown and water available for irrigation are taken. The general body meeting may also be called upon the direction from the Government or the Commissioner of the Command Area Development or even by the next higher tier of the farmers' organization in regards to any urgent public notification. How this attribute of social and structural cohesion influences the action situation to cause arbitrary reallocation of water is described in the next chapter.

5.2.3 Urban Water Actors

Sahu (2010) elaborately described the number of government organizations and water-related actors responsible for urban water provision in Hyderabad. Principally, the Water Board (HMWSSB) is responsible for the provision of urban drinking water. Besides this, even though the Municipal Corporation, (i.e. the local government) also has the authority to undertake the water supply functions, its limited function is, however, prominent with the absence of the Mayor and the Councilors as Members in the HMWSSB. Municipal Corporators, in general, are involved in urban governance at the municipal level, serving as people's representative to bridge and facilitate communication with the administration. Municipal Corporators are elected for a five-year term. They are responsible for overlooking the development on various issues in their constituencies, including issues on access to drinking water. Together with MLAs (Members of Legislative Assembly) and MPs (Members of Parliament) they form a general body and have meetings at regular intervals to discuss issues as brought forward in their constituencies. There is no administrative provision of formal relations between the Corporators and HMWSSB, but rather their interaction takes place informally, primarily based on affiliations of a political party and personal relationships.

It may, however, be noted that while the Municipal Corporators do not take part in the decision-making process, the proposals they forward are reviewed and considered to be included in the final urban water plan which is primarily drawn up by the HMWSSB. Regarding the urban citizens, they are collectively represented by the Resident Welfare

Association (RWA), which are essentially self-managed neighborhood communities. To solve the many urban problems, political intervention or intermediation in the urban local bodies were not too effective. In response to this, Residents Welfare Associations (RWA) were formed to create an opportunity to self-manage and govern on issues in their areas. The main objective of RWA is to collectively make representations in addressing any grievances relating to urban public service such as water works. The RWA specifically makes an endeavour to create awareness of responsibilities and rights of the citizens in order to empower residents. Thereby residents may be able to supervise the implementation of various responsibilities which have been entrusted to the urban bodies according to 174th Amendment and Article 232 of the Constitution. Many RWAs are further constituted to be known as the United Federation of Resident Welfare Associations (U-FERWAS). The Municipal Corporation of Hyderabad now considers the RWAs as partners for efficient delivery of public services to the citizens without the baggage of political involvement (United Federation of Resident Welfare Associations, 2012).

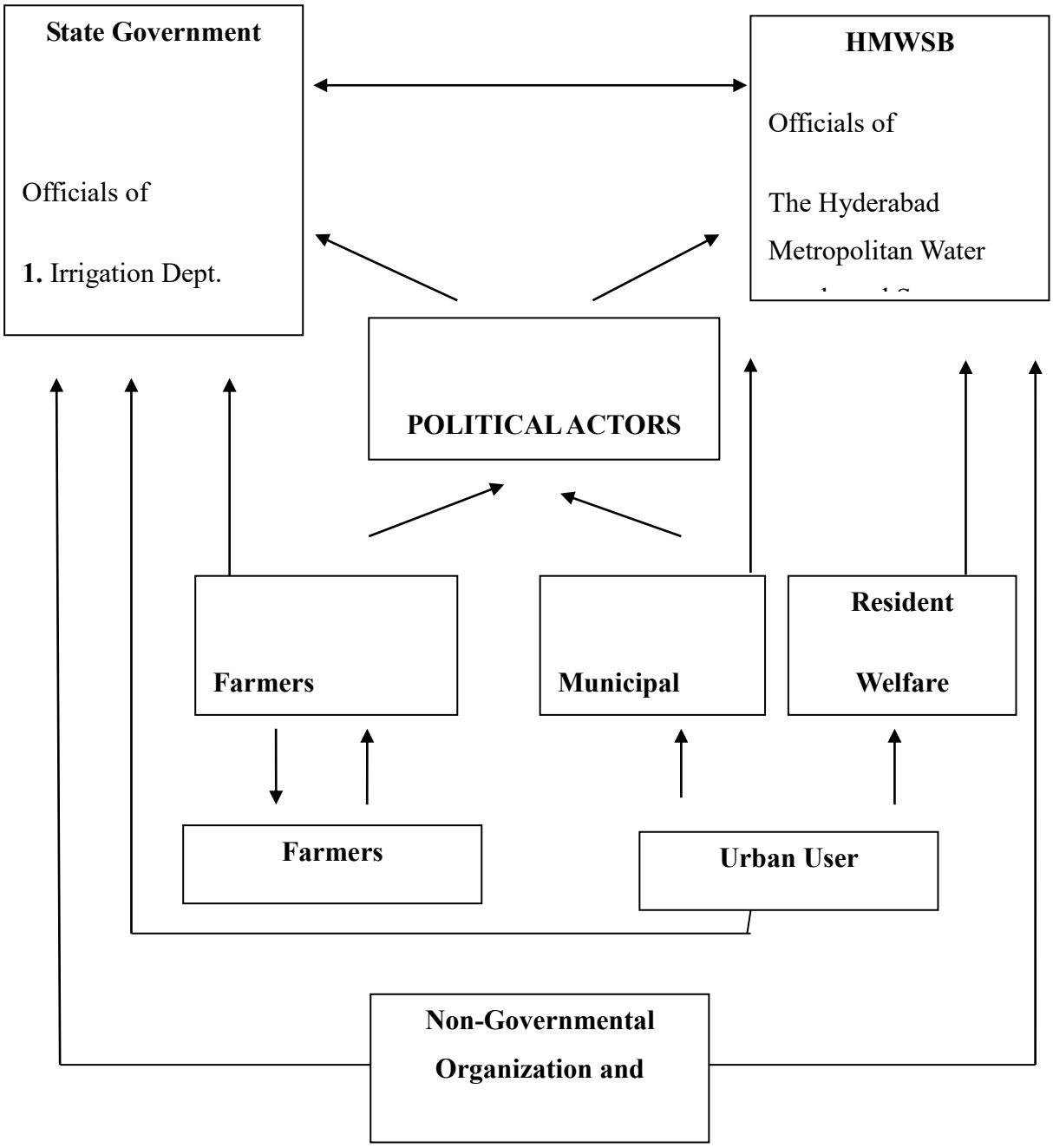

Figure 5-1: Water-Related Actor Interaction Network

Source: adapted from Sahu (2010).

5.3 Political-Economic Context

The way in which the 'politico-economic' context affects the action arena depends on how various participants are particularly positioned in the action situation that helps us to

understand the distribution of decision making power amongst them. It also draws attention to the way in which the political and economic interests of actors have influenced their decision-making process within a particular set of rules-in-use (Clement, 2010: 137). Hence, closely examining the rules will give some explanation how the current set of rules-in-use affects the pattern of power distribution amongst participants, particularly the administrators and politicians. The following section firstly examines rules which inform how the current set of rules-in-use affects power distribution. Secondly, it examines the way in which water allocation and management rules are in place in Andhra Pradesh in general and Hyderabad in particular.

5.4 Water Management and Allocation Rules

Ostrom defines rules-in-use as the understanding shared among participants referring to enforced prescriptions pointing out what actions are required, prohibited or permitted (Ostrom, 1999: 50). They refer to both formal and informal prescriptions, e.g. legal documents issued by central governments, and the informal rules allowing interpreting these documents with relative freedom. To understand how the rules-in-use affect the action arena, we need understand the interaction of formal and informal rules affecting the behavior in the action arena. Within the action arena, there is the action situation which is the social space where individual interact to make choice. The structure of this action situation as given by Ostrom (2011: 19) depends on a set of seven variables. They contain a set of actors, positions that are filled by those actors, a set of allowable actions, some level of control over the choices of each participant, information that is used to guide choices and identified costs and benefits or actions. Ostrom views the action situation as partially dependent on rules and therefore provides us with a set of working rules that affect these seven set of variables in the action situation. However, Ostrom emphasizes that working rules alone never provide a necessary and sufficient explanation of the structure of an action situation. It may be noted that other factors, such as the biophysical and the community attributes, besides rules also affect the action area. The seven types of rules should constitute the minimal but necessary set of rules, which is needed to offer an explanation of actions and results based on the working rules used by participants to order their relationships within an action situation.

Ostrom (2011: 19) explains these seven types of rules as follows. Boundary rules define the attributes and conditions required to enter or gain a position in an action situation. In applied terms, this means that boundary rules define who has a right to enter and use a resource. In other words, who has a right to a position in the resource use or management system? This eventually affects the types of participants with whom other participants will be interacting in relation to a particular resource. The position rules are placeholders for participants to enter the process (Crawford and Ostrom, 2005). Sets of rules assign different kinds of authority to different positions. For example, the resource user, government agency and the community-based organization are likely to have different positions and different types of authorities over natural resource management based action situations. Authority rules specify the actions that participants in a particular position may undertake. Scope rules specify the jurisdiction of outcomes that can be affected. Information rules specify the amount and type of information for interaction and communication between participants in an action arena. Payoff rules specify how costs and benefits are assigned in the action arena. The entire exchange of choices, interaction and outcomes are made possible by the presence of rules. Rules are the limitations created by humans with the intent to solve specific problems. It includes all components that require, permit or prohibit a certain action and the consequences that ensue if the rule is not followed or adhered to. The rules in questions may be in the form of statutory policies, cultural framework, established laws, social norms or regulatory structure. Laws by the central, regional, local or special government are no doubt important rules to be considered.

The focus of the institutional analysis examines how the rules-in-use affect the action arena by understanding the interaction of formal and informal rules affecting the behavior in the action arena. It is important to focus on the operational rules (informal rules) largely used by most participants. In order to examine what these informal rules are, how they evolve, the reason why participants choose to either follow these rules or not, a sample of the population is selected. This sample of the population is then probed with the above seven types of rules (Polski and Ostrom, 1999: 16). Ostrom further provides ample guidelines by presenting a set of questions that are designed to undertake the analysis of rules-in-use that essentially structures an action situation, which is described in the next section.

By the constitutional provision of water resources in India, various water institutions in Andhra Pradesh can be found at the national level and the state level (Sahu, 2010). However, since this study focuses specifically on the inter-sectoral water allocation, it identified and took into consideration only those relevant institutions to carry out the institutional analysis. The key water provisions under review are briefly described chronologically. To take care of the urban water provision, the Hyderabad Metropolitan Water Supply and Sewerage Act was passed in 1989. In the year 1997, the State passed the Andhra Pradesh Farmers' Management of Irrigation Systems (APFMIS) Act that provided for the handing over of water management responsibilities in irrigation canal systems to associations of farmers. In the same year, the Andhra Pradesh Water Resources Development Corporation (APWRDC) Act was enacted sanctioning the setting-up of a corporation in charge of managing water resources in an integrated manner, notably through planning and coordinating water use by different sectors.

In the National Water Policy (NWP) issued in the year 2002, it reflected the need for planning as well as setting up the institutional mechanisms in order to handle multi-sectoral water uses. It also reiterated that drinking water was to be given highest priority over all other uses. In the year 2002, Andhra Pradesh Water Land and Trees (APWALTA) Act was passed to deal with issues concerning the protection of groundwater and surface water. The Andhra Pradesh State Water Policy of 2008 explicitly called for the establishment of the Andhra Pradesh Water Resource Regulatory Commission. The key documents pertaining to the water management which focuses on the inter-sectoral water management are indicated in section 4.4.1 in the previous chapter. How each legal entity within these documents embeds Ostrom's seven types of rules, and how it eventually influences the action arena is described in the next chapter.

5.5 Integrating the Analysis

The action arena is the core unit of analysis in the Institutional Analysis and Development (IAD) framework. Within the action arena, there is the action situation as well as the actors who take part in the interactions in the action situation (Polski and Ostrom, 1999: 6). Typically in an action situation, individuals undertake wide range of interaction like exchanging goods and services. It may also involve interaction which solves problems or conflicts, amongst the wide range of interactions they may be involved in. Participants present in this situation and the roles are they assigned with to undertake particular actions are all

influenced by factors in the bio-physical world, the attributes of the community, and the rules-in-use. Ostrom builds on the game theoretical language to create a systematic way to classify generic rules in the assumption that any human interaction is composed of seven working parts. She describes the seven working parts characterizing such action situation in which participants decide upon how to act (Ostrom, 2005: 187-192). These seven clusters of variables are: who are the participants present in this situation and what are the roles are they assigned with, to undertake particular actions. What is the possible level of control that each participant has, and what could be the possible outcomes for this situation? What amount and level of information does the participant have regarding the action situation? And finally, what cost and benefits do participant experience when they take undertake such actions in this particular situation? Ostrom (2005) summarizes the links between these variables as follows (see Fig. 5-3): "a) actors and actions are assigned to positions, b) outcomes are linked to actions, c) information is available about the action-outcome linkages, d) control is exercised over action-outcome linkages, and e) costs and benefits are assigned to action-outcome linkages" (Ostrom et al., 2014: 272). In other words, actors in positions choose among actions at particular stages of a decision process, in light of their control over a choice node, the information they have, the outcome that is likely, and the benefits and costs they perceive for these outcomes.

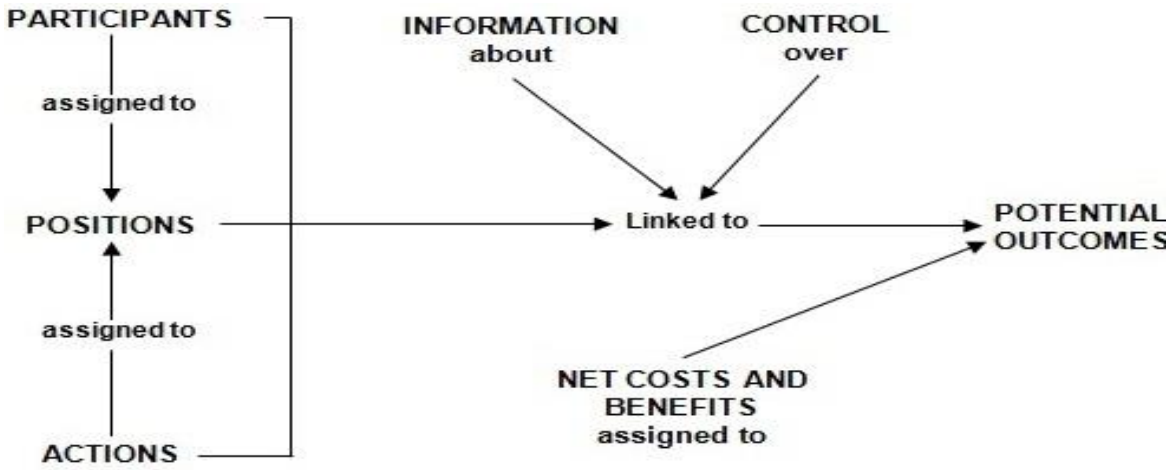

Figure 5-2: The Internal Structure of an Action Situation of the Institutional Analysis and Development (IAD) Framework

Source: **Ostrom (2005: 33)**

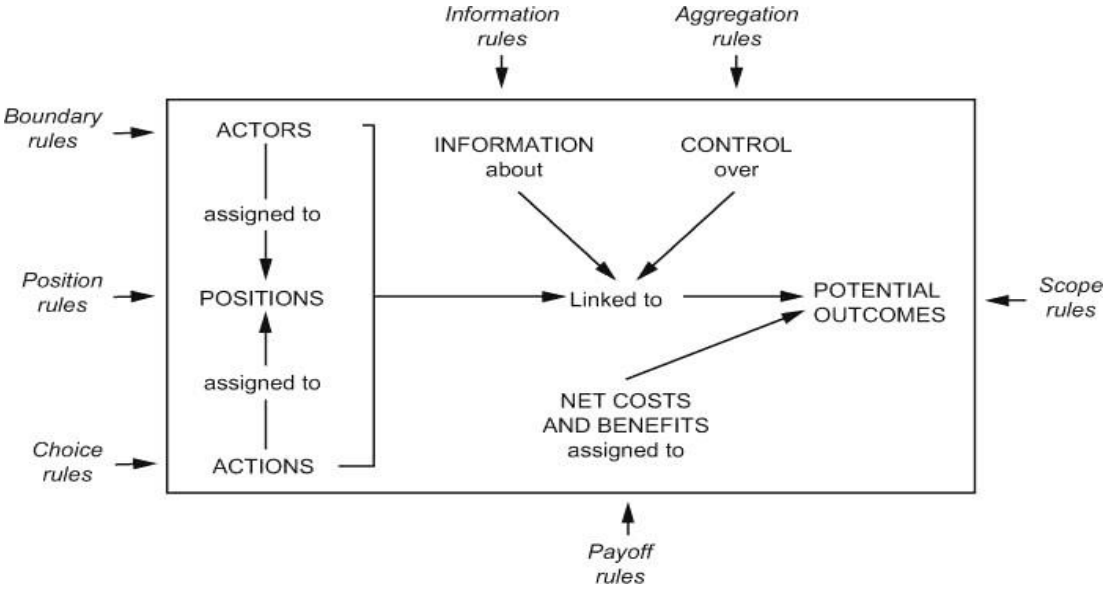

Figure 5-3: Rules as Exogenous Variables Elements of an Action Situation *Source:* Ostrom (2005: 33)

5.6 The Action Situation

Up to this point, all participants were identified and characterized independently. In addition, the biophysical setting of the case study was presented. This section goes one step further and characterizes the action situation as the focal unit of analysis (Ostrom, 2005: 32). First, the positions of the actors as the connecting link between participants and actions (Ostrom, 2005: 41) are elaborated, which is important in understanding the kind of interaction that happened.

5.6.1 Position and Boundary Rules

Analysis of who takes part in the action situation to carry out the reallocation of water against the prescribed guidelines, i.e. participants, and allowable actions is carefully undertaken by examining how the exogenous variables (position and boundary rules within the rules) influence the participation of water-related actors.

As a precursor to understanding the subsequent section, it is important to understand that 'Water' in India is a State subject. Here the respective Indian states exercise legislative powers over water. However, the Union, i.e. the Indian Ministry of Water Resources, is responsible for laying down policy guidelines and programmes for the development and regulation of the country's water resources. It looks into the overall planning, policy formulation, coordination and guidance in the water resources sector in general. In addition, the Union also looks into

the aspect of inter-state river waters as well as with the aspect of resolving a dispute between the states in relation to sharing of river waters. It may be noted that all the rivers in India are inter-state.

The legislatures of each State in India have their own laws that deal with all the characteristics relating to control, regulation and distribution of water. Hence, there is an elaborate network of laws regarding all use of water sources including groundwater, canals and irrigation and drainage and sewerage. According to the Constitution of India, the state takes the responsibility of water supply not only for all the sectors but also for all purposes. This is executed through the urban local bodies, Water Boards at the state level or either the statutory or non-statutory bodies through various departments at the city level. However, there are some instances where states such as Andhra Pradesh give the responsibility to Water Boards in large metropolitan cities, such as the Hyderabad Metropolitan Water Supply and Sewerage Board. The Irrigation and Command Area Development (CAD) Department is responsible for the irrigation needs of the state of Andhra Pradesh and owns almost all the surface water in the state. Whenever water supply schemes are based on surface water, the user department needs to coordinate with the Irrigation Department to negotiate water allocation.

Considering water as an economic good, water sector reforms across the country made provisions of transferring power from government ministries and departments to independent water authorities. This was mainly to give more freedom from political interference as well as to facilitate private sector participation (Koonan and Bhullar, 2012). This section examined how these various water reforms over the years have placed 'formal' positions of various water-related actors, which allow or deny their participation in the management of water resources. Subsequently, how various actors positions themselves 'informally' to participate (in the action situation) to secure water for themselves in times of scarcity is examined. In the study context, boundary rules are essentially entry and exit rules. Here, who has the right to access and use of water resources in the state of Andhra Pradesh is described. Position rules describe the relevant actors and their position by classifying them according to groups of actors. Such classification may be based on the organization they belong to, the administrative level at which they exercise their role, and the possible role they are entitled to play in policy implementation. Here positions are created and specify which actions are assigned in terms of

duties and responsibilities. In other words, set of rules assigning a different kind of authority to a different position in the inter-sectoral water resource management in Andhra Pradesh.

For instance, the resource user, government agency and the community-based organization are likely to have a different position and different types of authorities over the natural resource management based action situation. Here the distribution of management roles of various relevant participants and actors across various departments are specified. This subsection will also highlight the distribution of power indicating which group of actors with their assigned role will have varying influence in the management of inter-sectoral water allocation, which eventually plays out in the outcome of arbitrary water reallocations. Taking a cue from the water reforms passed in the state of Andhra Pradesh, the following Acts (HMWSSB Act of 1997, AFPMIS Act of 1997, APWRDC Act of 1997 and APWRRC Act of 2009) defines how various actors were positioned in water resources management over the years, pertaining to the case study of Hyderabad.

Ambiguous Responsibility Entrenched in the HMWSSB ACT (1997)

As per the Hyderabad Metropolitan Water Supply and Sewerage Act, 1989, the Hyderabad Metropolitan Water Supply and Sewerage Board (HMWSSB) was constituted on 1st November 1989. The Board is an autonomous body under the Act. It was created to give administrative and financial independence in a bid to empower the Water Board a greater control over operation and decision-making and also safeguard it from political interferences. However, the Chief Minister of Andhra Pradesh serves as the Chairman of the Board and therefore has not been able to be independent of the political establishment as it was originally intended to.

Secondly, as per the mandate of the HMWSSB, it essentially should exert control over Hyderabad water supply infrastructure. However, the Irrigation Department has a strong influence on the supply of water to Hyderabad. It may be noted that both the sources supplying water to Hyderabad (Singur reservoir on the Manjira River Nagarjuna Sagar reservoir on the Krishna River) are in charge of the Irrigation Department. Water from Singur reservoir is released to both the agricultural sector and the city as per the sanctioned dam operation rules by the government in 1990. This is done upon consensual agreement between

the Principal Secretary for Irrigation Department and the Managing Director of the HMWSSB. However, in the case of disagreement between the two, the matter is taken up to be resolved by the Chief Minister of the state. A similar situation is seen as water transfer to Hyderabad from the Krishna River is carried out through the Akkampally balancing reservoir under the control of the Irrigation Department. Currently, the Water Board is trying to obtain Government approval and financial assistance for constructing an independent structure over which it would have total control.

AFPMIS ACT (1997) and the Farming Actors

The 1997 APFMIS Act provided for the establishment of Water Users Associations within the farming community. This act made provision for the Water User Associations an entitlement to plan the distribution of water among their members and regulate water use which was previously entrusted to the Irrigation Department. This act was implemented to specifically deal with the gradual decrease of the irrigated areas, low rate of water fee collection, infrastructure maintenance of and the overall decline in agricultural productivity. Despite the implementation of the reform, there have not been any changes regarding the water users in terms of their rights over water. The only difference noted is that, whereas the State still kept in its hands the proprietary rights over canal water, usufruct rights were vested in the control of the Water Users Association (Celio 2007). Whilst the farming community forms a major share of water users, they were kept out of issues pertaining to inter-sectoral water allocation and management.

APWRDC Act (1997) and the Political Actors

The idea of setting up a separate authority at the state level for water regulation was taken up in Andhra Pradesh. This authority was in essence envisioned to take charge of managing water resources in an integrated manner by coordinating water use by different sectors. Hence the Andhra Pradesh Water Resources Development Corporation Act, 1997, was implemented. However, it continued to be controlled by the government. The Act made provisions for members of the Corporation to be either elected by the Government or be an existing member of the Government of Andhra Pradesh.

APWRRC Act (2009) and the Government and Farming Actors

The purpose of setting up the regulatory authorities across the country was in a bid to transfer regulatory powers from the government ministries and departments to 'autonomous' water regulatory authorities. These regulatory authorities were to not only exercise the rulemaking powers to regulate water, but also to carry out the implementation and dispute settlements. The core idea behind setting up such sector-specific regulatory authorities was to ease away from government and political interference, as well as to encourage and facilitate the participation of water management from the private sector. However, with the exception of some few states, the functioning of the regulatory authorities across the country including Andhra Pradesh is entrusted to civil servants; as a result, it compromises the independence of the authority.

5.6.2 Authority, Scope and Aggregation Rules

While this chapter describes what are the provisions within the Authority, Aggregation and Scope rules in Hyderabad study context, the next chapter will explain how the provision within these rules (authority, aggregation and scope) eventually influence the action situation to cause arbitrary water reallocation against the prescribed allocation guidelines

In the study context of Hyderabad, authority rules prescribe authority over whom and how the water resources are to be managed and allocated between the city and the agricultural sector. The officials authorized to implement this water allocation rules are from the Irrigation Department and the Hyderabad Water Board. They 'must' jointly agree on the water to be released as authorized, but however 'must not' give water to the agricultural sector beyond certain prescribed limit as per the allocation rules set in the Government Order 90. In the case of discordance between the two authorized officials, the matter was to be taken to the Chief Minister. This ambiguous and multiple jurisdictions of water authority in the case of Hyderabad necessitates a careful examination of aggregation rules to determine the level of control each authorized position has in the decision-making process of inter-sectoral water allocation and management. In addition, the scope rules describe the condition under which authority rules for water allocation must be observed.

In the reallocation of water from the Manjira River, the primary allocation issue was between Hyderabad and Ghanpur and Nizamsagar irrigation projects. The issue was addressed by allocation 'rights' through the administrative authority in India - the Government Order (G.O. 90). The G.O. stipulated Hyderabad water entitlement to 197 Mm3 annually from the Manjira reservoir. The Ghanpur and Nizamsagar irrigation projects were allocated 352 Mm3. It may be noted that the G.O. gave priority to drinking water for Hyderabad, where it clearly stated that water would not be allocated to the agricultural sector when water in the reservoir falls below a prescribed level, which should be reserved only for Hyderabad's drinking needs. The Government Order 93 (IRRIGATION and C.A.D. (Irrgn. lV) DEPARTMENT G.O. (Ms). No.93, Dated: 24-02-1990) specifying the operational rules of the Singur reservoir typically represents a combination of Authority and Scope rules. Para 1 of the document determines what actions the participant may undertake to carry out the water allocation and management process ("Manjira Water Supply Scheme Phase-III has been taken up for an additional supply of 4 TMC of water to Hyderabad with Singur reservoir as a source. Singur dam was constructed by Irrigation Department to meet the said requirements for the city of Hyderabad and to stabilise the Irrigation under existing Nizamsagar, Fatehnagar and Mahaboobnagar systems"). Para 17 of the document sets the conditions for participant to undertake the authorized actions ("Water for Irrigation shall be released only when the water levels are higher than the minimum levels indicated in para 16(c).")

Authority rules also determine whether a decision by a single or multiple participants is needed prior to an action at a decision point in a process. In cases where authority rules provide multiple positions partial control over the same sort of actions, aggregation rules are needed, which may be symmetric or asymmetric. Whilst the authority and scope rules are straight forward in Hyderabad's case, aggregation rule makes an interesting case. In the study context, aggregation rules are symmetric, i.e., multiple participants have joint control over the decision-making process (Ostrom, 2005). As per the mandate of the Hyderabad Metropolitan Water Supply and Sewerage Board (HMWSSB), the board was meant to have total control over Hyderabad water supply infrastructure.*"On and from the date of coming into force of this chapter, all public reservoirs, tanks, cisterns, fountains, wells, and bore wells, pumps, pipes, taps, conduits and other works connected with the supply of water to the Hyderabad Metropolitan area, including the head work, reservoirs (...), shall vest in the Board and be*

subject to its control" Chapter IV, Section 17, Hyderabad Metropolitan Water Supply and Sewerage Act, 1989.

However, both the reservoirs (Singur across the Manjira River and Nagarjuna Sagar across Krishna River) are multipurpose, serving Hyderabad for drinking water, agriculture, and hydropower. Both are principally controlled and operated under the responsibility of the Irrigation and Command Area Development (CAD) Department of Andhra Pradesh. This makes it necessary to share jurisdiction for water management between the Irrigation Department and the Water Board. The water allocation between the agriculture and the city of Hyderabad is carried out through the administrative water allocation mechanism in place. This was put into effect by the Government of Andhra Pradesh via two Government Orders (see G.O. 90 in 1989 and G.O. 93 in 1990). The release of water from the Singur reservoir for the agricultural sector is sanctioned as per the allocation rules in place, according to the consensual agreement between the Principal Secretary for Irrigation and the Managing Director of the HMWSSB. However, in the case of any dispute between the two, the matter is directed to the Chief Minister, who is also the Chairman of the HMWSSB eventually decides. A similar arrangement is in place for Krishna water. Here again, the water transfer to Hyderabad from the Krishna River is carried out through the Akkampally balancing reservoir which is yet again under the control of the Irrigation Department. This paramount powers vested in the Chief Minister accentuates the level of control that a participant holding a certain position exercises in a decision-making process, which Ostrom and Crawford (2005) understands as aggregation rules. This makes ways and has a profound influence on how water allocation and management in Hyderabad is deeply entrenched under political influence, which is explained in the next chapter.

5.6.3 Information Rules

According to Ostrom and Crawford (2005), information rules affect the level of information available to participants. It not only determines how information should flow among participants, but also the form in which communication should occur. In other words, these information rules determine the arrangements for interaction and communication between participants. For instance, through regular meetings and between participants and other actors, stakeholders, the public and other institutions; through annual reports and public consultations

and newsletters. While this section unravels the level of information available to the participants within the provision of information rules, the next chapter discusses how the provision within the information rules influences the actor interaction to eventually cause arbitrary water reallocation.

The Andhra Pradesh Water Resources Development Corporation Act of 1997 laid foundation for an independent body for planning and management of water resources in the State of Andhra Pradesh. However the constitution of the committees of the Act laid down the rules that "*The Corporation or any of its Committees may invite any officer of the Central Government/ State Government/ local authority or any organization or any person to attend its meeting or meetings as a special invitee for the purpose of assisting or advising/ on any matter or matters. The person so invited may take part in the proceedings/ but shall have no right to vote*".

Subsequently, the Andhra Pradesh Water Resource Regulatory Commission Act of 2009 evolved and was entrusted to carry out major water planning for all the sectors (such as irrigation, municipal/rural drinking water, electricity and industry) in the state of Andhra Pradesh. *"The powers, functions and duties of the Commission shall be as under (1) a) To determine the water requirement for various categories of users (such as irrigation, municipal/rural drinking water/industry etc) on a yearly / seasonal basis, b) To determine the requirement of irrigation water for the various levels of Farmers Organizations (namely, Project Committee, Distributory Committee and Water User Association) based on the cropping pattern approved by the project authorities on a yearly / season basis and implement the same,"* which can be found in the Andhra Pradesh Water Resources Regulatory Commission Act 2009, Chapter III, para 14, Section (1).

These acts, in general, provided information about how various actors should participate and interact while managing water resources in the state of Andhra Pradesh. However no farmer's organizations were included in the planning process which was outlined in the act that *"The Commission may as and when needed and decided by them invite special invitees from,- a) experts who are having adequate knowledge, experience or proved capacity in dealing with the problems relating to engineering, agriculture, drinking water, industry, law, economics, commerce, finance or management for assisting the Commission in taking policy decisions. b)*

members from farmers Organizations within the State" which can be found in the Andhra Pradesh Water Resources Regulatory Commission Act 2009, Chapter II, Para 4, Section (2) Provision of 'Special invitees as and when required by the Commission'.

There is a provision in the act which allows representatives of important actors to participate in the decision-making process. However, it states that the regulatory authority 'may' invite experts and members from farmers' organizations, but only as special invitees. It may be further noted that the decision to invite them is at the discretion of the members of the regulatory authority. It explicitly allows 'experts' to assist the authority in recommending policy decisions. However, members of farmers' organizations have been granted with no such role. This non-inclusion of farming actors in the planning process has kept them away from access to information about the actual resources available. How this factor of information or the lack of it influences the process of actor interactions and arbitrary water reallocation is discussed in the next chapter.

5.6.4 Payoff Rules

Payoff rules identify sanctions for taking 'mustn't' actions. In the water regulation, allocation and management; payoff rules determine who bears the cost if rules are violated. In the same way, it also assigns the benefits of following rules in the action situation. Regarding costs and benefits, an institutional analysis should distinguish between the physical outcome, the external reward or sanction, and the valuation that the participant assigns to each of those aspects (Ostrom 2005a: 52). i.e. how various actions could either cost to each type of participants or benefit as a result of various group outcomes is played out in the action situation. Ostrom and Polski (1999: 17) explain that information rules specify the amount and type of information available to participants concerning enforcement in an action arena. The rule that makes information about the enforcement of water management pertaining to its use and allocation can influence the way water-related actors interacts and behaves in the action situation.

Taking the study context of Hyderabad, provision for imposing sanction rules has been prescribed in the Andhra Pradesh Water Resources Regulatory Commission Act of 2009 under the clause of Powers, Functions and Duties of the Commission to "*Fixing and monitor implementation of stipulated quality standards for management of water resources by various*

water users/departments and recommend actions against violations". It further outlines that "*the Commission shall in case of non-compliance of the specific directions in discharge of the powers under this Act, recommend to the Government suitable disciplinary action against such Government officials*". In this regard, specifically looking at the Government Order 93 ordering the operational rules of the Singur reservoir (IRRIGATION and C.A.D. (Irrgn. lV) DEPARTMENT G.O. (Ms). No. 93, Dated: 24-02-1990) Para 1 determines the amount of water allocated for the city and the agricultural uses. Para 17 of the document sets the conditions for participant to undertake the authorized actions ("Water for Irrigation shall be released only when the water levels are higher than the minimum levels indicated in para 16(c).") However within this G.O. 93, there is no clause of sanctions against violation of this prescribed limitations and conditions of water allocation rules, in compliance with the Andhra Pradesh Water Resources Regulatory Commission Act of 2009 which is vested with the authority to impose sanctions against violations.

5.7 Participants Perception of Water Resource and its Management

This section documents a typical representation of farmer's perception on their daily way of agricultural life specifically pertaining to water access and management which was documented during the field work conducted in the year 2013. Mr Srinivas, a farmer is the official Village Servant, Rampur Village under the command area of Ghanpur irrigation project in Medak District (Figure 5-5). He has been the official village servant for the last four years, who took over the position after the passing away of his father. As we walked along the canal, he explained the canal water from Ghanpur irrigation project (which originally gets water from the Singur reservoir) flows into their village from Kistapur village, then flows on to Rampur, Macharam, Bolaram, and then on to Medak. There are about 400 farmers in the village and each farmer has cultivable land between 1-3 acres. For water to flow into their fields, for 1 acre each, a farmer pays Rs.200/year/per crop. Water is drawn out of the main canal to their field through pumps as long as there is electricity. Generally, all farmers have the same level of water requirement because they grow the same crop in the same season.

The crops primarily grown are paddy which is purchased by the Food Corporation of India (FCI) located in Medak. Sugar cane is also grown and is sold to the Deccan Sugar cane factory which is 2 Km away, where the crops are deposited individually. The Singur reservoir

releases water into the Ghanpur irrigation project twice a year for Kharif (summer crop) and rabi (winter crops). When there is no water released from the Singur reservoir, the canal goes dry. To manage the water resource system, there is a water body Committee called 'Mehbub Meher' Committee (consisting of one president, one vice-president and six members) from 4 villages i.e. Rampur, Kistapur, Machavaram and Perur (2 each). For election to this committee, the Irrigation Department picks up a suitable day to organize the election. The villagers nominate the candidates and voting take place. The farmers in the village are also aware that as per government order, only if the water is above 8 TMC yearly, the water from the Singur reservoir will be released twice (end of June to October-November) and the other time during January to May 1st week. They are aware that the water and all irrigation structures are owned by the Irrigation Department, to which they pay taxes to use the water. The water depending on the electricity is available for seven hours.

Figure 5-5: Interview with the Official Village Servant, Ghanpur Village

Source: photo documentation, (Own) October 2013

Three years ago, as a result of four dry months, the Singur reservoir went dry and hence could not release any water and there was a crop failure (Rabi crop) which is their second crop. In

such instance of water scarcity, the people approached their MLA, who then approached the District Collector. Depending on the water assessment of the requirement of the village, the District Collector forwarded the recommendation to the Irrigation Department. With pressure from the politicians, water was eventually released according to the ratio of the land under cultivation. Eventually, whatever water released is equally distributed. In order to adapt to such rainfall variation, the farmers usually change the crop from paddy to crops requiring less water such as maize, groundnut and sunflower. It may be noted that when there is a crop failure, the way the farmers earn their livelihood is through government supported scheme such as 'Work for Food'. This involves building and repairing canals, roads etc. for which they are paid. This alternative arrangement goes on for about four months. Additionally, the bank loan repayment against the previous loan is extended and new loans are provided which is aided through Societies called Primary Agricultural Co-op Society, where all farmers in the village are members of such society. There is a President, Vice President, Secretary and a Member. The area of land to be cultivated during the season is assessed by the society. Accordingly, they arrange the finance for the farmers by approaching the bank, which is the State Bank of Hyderabad, Agricultural Development Bank. There are 22 villages under this jurisdiction and hence twenty-two such Co-operative societies exist. In Medak district, there are 46 villages and if total agricultural production falls below 33 percent, it is considered a drought affected area. Another alternative to supplement income in times of crop failure is also through dairy and livestock.

5.8 Key Intersectoral Conflicts and Arbitrary Reallocation of Water

Based on the data I have collected, this section charts the key events documenting competition and contestation between the urban needs of Hyderabad and agricultural uses. These intersectoral water conflicts have persisted since the inception of water structures constructed across the Manjira River as well as the transferring of Krishna River water through the Nagarjuna Sagar Dam, primarily meant for agricultural purposes originally. Set against the background of prevailing adverse climatic factors, events indicating such conflicts, which have been expressed through hunger strikes, public hearings, representations and meetings, have been well documented. Based on my own data, this section seeks to more precisely set the context of this research study in order to eventually understand and unravel the processes and causes leading to such conflicts.

Celio and Giordano (2007) have noted how, due in part to uncertainty over monsoon inflows into the Singur Reservoir over the years, the agricultural sector surrounding Hyderabad has largely failed to secure its share of water within the existing intersectoral water arrangements. Under such conditions, it has proven to be a tricky situation for the government of Andhra Pradesh to take the risk of providing the agricultural sector with the amounts of water it is supposed to be allocated, which would mean reducing the stock in the Singur Reservoir available for Hyderabad's drinking needs. Since the Singur Dam came into being in 1990, its supplying water to Hyderabad as well as for agricultural purpose has ignited such conflicts. The seeds of contention were first sown in 2003, when the Congress political party staged a 102-day relay hunger strike, demanding Singur water for irrigation in the Medak and Nizamabad areas. This sentiment continues to resonate to the present day, where an anonymous farmer during one of my field stay revealed: "*We really do not know what is going on at the high level. All we know is water from Singur will first fulfil the needs of Hyderabad city and then only will come to us. However, this water originally belongs to us and we will fight for it*".

The hunger strike was based on the historical mandate of the Singur project, where the original plan was to supply 4 TMC water for Hyderabad's drinking purposes and enough to irrigate 45,000 acres of agricultural land in the Jogipet and Sangareddy areas of Medak District and release water to the Nizamsagar project for irrigation in Nizamabad. The plan went haywire, as 13 TMC water was supplied to Hyderabad at the expense of meeting the irrigation requirements of Medak and Nizamabad. Mr Appi Reddy, Farmer's Leader from Nizamabad, grieved how "*The construction of the Singur project for diversion of water to the twin cities was the biggest injustice to the Nizamsagar peasants, as they had never got more than 8 TMC of water after the project came up*" (The Hindu, 2010).

It had become evident that the Singur project was increasingly dedicated to being a drinking water project to cater to the growing needs of Hyderabad, with Government Order 93 further strengthening that process. Venkateshwar Rao, a farmer from Renjal Mandal, was reported to lament "*I used to cultivate paddy in the entire stretch of 10 acres when water from Nizamsagar project was available. But now, I cannot cultivate paddy because of construction of Singur project in the upper reaches of Nizamsagar project*" (Times of India, 2010). An irrigation expert, as quoted in the Times of India (2010), further corroborated the farmer's

plight by saying "*In view of taking Manjira water to Hyderabad for drinking purposes, Singur balancing reservoir was built in Medak district. Since the reservoir came into being, inflows into Nizamsagar have dwindled. The farmers are hit badly because of this*".

The momentum picked up in 2005, leading to a key event in this conflict. A public hearing on water issues related to Telangana was organized by the Telangana Natural Resource Management. It garnered considerable attention due to the presence of the former Judge of the High Court, the former Vice-Chancellor of Padmavati Mahila University and the former Chief Engineer of the Central Water Commission. The very purpose of the public hearing was to register their demand to restore the rights of the Manjira basin farmers. The public hearing proceedings were sent to the Chief Minister and other ministers and officials concerned. The representatives of the Nizamsagar Ayacutdars Protection Committee reiterated that successive governments preferred to quench the thirst of the urban dwellers, leaving farmers high and dry. The state government eventually issued orders for the diversion of 2 TMC from the Singur Dam out of Hyderabad's share of drinking water to stabilize an ayacut of 40,000 acres in Medak district. The state government's decision was based on the pre-electoral demands put forth by the Telangana Rashtra Samithi with the Congress Chief Minister, much to the dismay of the Hyderabad Water Board officials, who argued the irrationality of the government's decision which contradicted the future city's water needs being met from the Krishna River.

It was also in 2005 when the first arbitrary allocation of water to the agricultural sector took place against the prescribed water allocation guidelines. Following a poor monsoon, the government gave in to the demands of the farmers of Medak district, and about 1 TMC of water from the Singur Reservoir was let into the Ghanapur channel for the Rabi crop. This release of water for the farmers was announced by the sitting Major Irrigation Minister, despite concerns and protest being raised by the Hyderabad Water Board authorities. Marred by bad monsoons, water supply to the city was similarly facing a severe crisis, as the water levels in the two other water sources – Osmansagar and Himayatsagar dwindled. The water level in Himayatsagar was 1,734 ft, which was 4 ft short of the level from which it could be brought to the city by the force of gravity. Similarly, at the Osmansagar source, the level was 1,765 ft, with only a capacity of 0.4 TMC, putting the city's drinking water supply under severe stress. The Hyderabad Water Board protested that of the 7 TMC in the Singur

Reservoir, almost 1 TMC amounted to the dead storage level and an equal volume should be accounted for as evaporation losses. If another TMC of water was given away for agriculture, then the remaining 4 TMC would barely meet the city's drinking water needs until year-end. However, eventually, as already mentioned 1 TMC of water from the Singur Reservoir was let into the Ghanapur channel for the Rabi crop.

In 2009, the State government yet again decided to release 0.3 TMC of water to Ghanapur ayacut from the Singur Reservoir. The decision was taken by the sitting Congress Chief Minister Rajasekhara Reddy, and orders were issued to this effect. In addition, the Nizamsagar ayacut was under acute drought conditions. The Minister for Major Irrigation convened a District Irrigation Advisory Board meeting, based on the conclusions of which the government also decided to release 2.5 TMC of water from the Singur Reservoir to the Nizamsagar irrigation project.

In 2010, the Singur Reservoir, which has a maximum storage capacity of 30 TMC, was left only with 12 TMC due to poor rainfall. About 0.6 TMC was allocated for drinking water purposes every month, while 2.5 TMC was required for irrigation. With such a bad monsoon, it was reported that crops on 2,500 acres under the Ghanpur ayacut were on the verge of withering, as water had not been released in time from the Singur Reservoir. So, the Ayacut Committee chairperson lodged a complaint to the Sri Krishna Committee, lamenting that they should have received 4.06 TMC of water as their right under the ayacut but never received that much water, as it was being diverted to Hyderabad for drinking purposes. Further, a team of farmers also met the State Human Rights Commission Chairman to address the problems of water not being released from the reservoir. The Chairman henceforth directed the Principal Secretary of Minor Irrigation to release water for Ghanapur ayacut from the Manjira Reservoir. This mounting pressure from the farmers on the Irrigation Department to release water to Nizamsagar Ayacut and Ghanapur Ayacut for cultivation put the Water Board in a critical situation, urging the Irrigation Department not to release the water. The Water Board eventually took up the issue with the sitting Chief Minister, Rosaiah, and the Irrigation officials were henceforth directed to ensure supply of water for agriculture without disrupting drinking water supply to Hyderabad.

At the same time, in Nizamabad district the problem of water scarcity was hitting paddy farmers the worst. The Kharif paddy sown covered only 45,512 hectares, though under normal circumstances it would have covered 94,267 hectares of the command area. But the water level in the Nizamasagar Reservoir, which normally received water from the Singur Reservoir was almost at dead storage. Although the storage capacity of the Nizamsagar Reservoir was 17.8 TMC, not even 1TMC water was available. As a result, the farmers in the Nizamsagar irrigation ayacut complained to A.D. Mohile, irrigation consultant to the Justice Sri Krishna Committee that the construction of Singur project had turned out to be a bane for them. A farmer's representative was reportedly quoted as saying *"In fact, we were happy when the Singur project was built as we were told that it was a balancing reservoir for the Nizamsagar project and was being constructed in view of the silt problem in the Nizamsagar. However, we were duped by Andhra rulers, as they had diverted water to Hyderabad for drinking purpose*" (The Hindu, 2010). The former Central Water Commission Chairman conducted a public hearing in which Farming leaders, people's organizations and the TRS political party participated. Eventually, 3 TMC water was released from the Singur Reservoir to save the standing crops under the Nizamsagar irrigation project, which ended up pushing the city into a severe water crisis.

This release of water from the Singur Reservoir to the Nizamsagar irrigation project was announced by the concerned Minister. As per Government Order 93, water from the Singur Reservoir was only to be released for the Nizamsagar irrigation project under the condition that 29 TMC of water was available. However, the Minister, sharing the sentiments of the farmers under severe drought, persuaded the government to release the water to the Nizamsagar project from the Singur Reservoir. This highly accentuates the role and influence of political actors in the arbitrary water reallocation practices of the study context.

In 2010, Hyderabad's water contestation with the agricultural sector for Krishna River waters surfaced yet again, when the state government decided to divert around 10 MGD of water from the Krishna Phase I project to en route villages of the Mahbubnagar and Nalgonda districts. The Water Board at that point of time supplied 332 MGD of water every day to Hyderabad against a demand for over 400 MGD. To supply 332 MGD of water to the city, 180 MGD of water was drawn from Krishna Phase I and II. This decision to divert water to

the en route villages meant reducing 10 MGD of water supply for Hyderabad, which would have otherwise fulfilled the water needs of about three lakh of its population.

In the beginning of 2012, the water level at the Singur Reservoir reached a disturbingly low level of only 520.142 meters. This was just enough water to either supply the city of Hyderabad with drinking water *or* the farmers for irrigation. The dam, controlled by the Irrigation Department, is obliged to abide by Government Order 93 to stop releasing water for irrigation and reserve it for Hyderabad's needs if the water level falls to 520.254. However, the Irrigation Department continued to supply water to the farmers, much to the dismay of the Hyderabad Water Board once again (The Deccan Chronicle, 2012).

5.9 Interaction

Interactions are a result of exogenous variables affecting an action arena and leading to outcomes. More specifically relevant to the issues addressed here, faced with acute water crises, water-related participants need to choose between different possible actions to secure water for themselves. An action "can be thought of as a selection of a setting or a value on a control variable […] that a participant hopes will affect an outcome variable" (Ostrom 2005a: 45). In the study context, the undertaken actions amongst competing urban and rural actors – ranging from representative actors requiring Hyderabad's drinking water to those in the agricultural sector needing water for irrigation – are a result of a decline in availability of water over time. They undertake various actions in the hope of eventually securing water for their respective needs. I have identified the following six major actions from the data gathered during the field research: water users appealing to political representatives of their constituencies, appealing to government authorities, appealing to the state's Human Rights Commission, conducting hunger strikes and, finally, engaging in public hearings. These interactions are further characterized below.

The first type of possible action involves water users appealing to political representatives of their constituencies in order to improve their water access and availability. This type of action is mainly taken by rural actors and, out of all of the identified actions, has been by far the most effective. It typically entails a farmers' group approaching its relevant political representatives, which may then involve taking the issue further to the Chief Minister, the Major Irrigation Minister and the Irrigation officials of the state. As already explained, the

Singur reservoir is a contested source of water for the two sectors of the Hyderabad area, where the management and allocation of water are under a rather complex arrangement. The release of water from the Singur dam for irrigation is authorized upon the joint decision of the Principal Secretary for the Irrigation Department and the Managing Director of the HMWSSB, based on existing dam operation rules. In cases of disagreement on any issues of water management and allocation between them, the matter is forwarded to the Chief Minister, who is empowered with the authority to eventually make final decisions.

Data from the field work reveal the interactions that prevailed in the study area in 2010, generally representative of this first possible type of action. In view of the drought conditions affecting the area served by the Nizamsagar ayacut, 5 TMC of water from the Singur Reservoir was released into the Nizamsagar project in August, as during this month rice is transplanted to paddy fields from nurseries and requires a good supply of water due to high evapotranspiration. The Minister, on behalf of the farmers as their political representative, was Sudarshan Reddy, who met the Major Irrigation Minister, the Chief Minister and Irrigation Department officials and was able to convince the government to immediately release the water, though this was an infraction of allocation guidelines. Upon reaching the Nizamsagar project, water was thereafter released for irrigation purpose to the affected area, as per the decision taken by the District Irrigation Advisory Board.

The second type of possible action involves farmers appealing to government authorities, particularly the Irrigation Advisory Board, which is chaired by the District Collector and has MLAs and MPs as members. Here, a farmer's group approaches the District Collector, who then calls for an Irrigation Advisory Board meeting to request the government to release water. In such meetings, the Chairman of the Water User Associations and the Chairman of the Zila Parishads are also present. As a result of such meetings initiated by the farmers, the District Collector, on behalf of the District administration, then puts in a request to the government, addressed to the Principal Secretary of Irrigation, to release water to the irrigation project from the Singur Reservoir. On some occasions, the District collector also forwards the request directly to the Chief Minister as well. Such a course of action was particularly prevalent in 2009, when elected representatives mounted pressure to release Krishna River waters from the Nagarjuna Sagar Reservoir, despite the water level hovering at 527.6 feet, as against the full reservoir level of 590 feet. Similarly, in 2010, Manjira River

water from the Singur Reservoir was released for farmers in the Nizamsagar and Ghanpur irrigation projects, facilitated through the government authorities.

The third type of possible action involves appealing to the state of Andhra Prdesh's Human Rights Commission, where a team of farmers meet the Chairman of the Commission to present their grievances about water not being released from the Singur Reservoir. A memorandum is submitted by farmers to which the Chairman responds by directing the District Collector to submit a formal report. The Chairman finally directs the Principal Secretary of Minor Irrigation to release water as deemed necessary. Instances of such action have been documented where Justice B. Subhashan Reddy, Chairman of the state Human Rights Commission (HRC), has directed the Principal Secretary of Minor Irrigation to release water for Ghanapur ayacut from the Manjira Reservoir in 2010. Here again, because of the nature of the contestation over Manjira River water, the Hyderabad Metropolitan Water Supply and Sewerage Board (HMWSSB) vehemently opposed releasing of water on the ground that there was an acute scarcity of drinking water.

The fourth type of possible action revolves around organizing hunger strikes. In 2003, for example, a 102-day relay hunger strike was organized by workers from the Congress political party on behalf of the farming community. They demanded water from the Singur reservoir in the Medak region. The hunger strike was based on an appeal to the historical rationale for the Singur project, the original plan for which was to supply 4 TMC of water to Hyderabad for drinking purposes, irrigate 45,000 acres in the Jogipet and Sangareddy areas and release water to the Nizamsagar project for irrigation in Nizamabad. However, the landmark Government Order 93, issued in February 1990, further strengthened Hyderabad's water priority, increasing its share by further supplying 13 TMC of water at the expense of meeting the irrigation requirements of Medak and Nizamabad. The hunger strike was eventually called off; following a promise by Mr Rao and other senior leaders in the Congress political party, assuring that water would be released from the Singur project to 40,000 acres in the Zaheerabad and Andole Assembly constituencies, as contemplated originally in the project proposals, if the party was returned to power. Eventually, in 2005, the state government, with the Congress party now in power again, issued an order for diverting 2 TMC from the Singur Dam out of Hyderabad's share of drinking water, to stabilize an ayacut of 40,000 acres in the Medak district. This decision for water diversion met one of the six demands put forth by the

Telangana Rashtra Samithi to the Congress Chief Minister, Y.S. Rajasekhara Reddy, during the elections.

The fifth type of possible action involves organizing public hearings. For instance, a key "public hearing on water issues of Telangana" was organized by the Telangana Natural Resource Management Group (TNRMG) in 2005. It was primarily organized to demand restoration of the right of farmers to Manjira River waters from the Singur Reservoir, which was being shared with Hyderabad for its drinking needs. The farmers represented were from the Medak and Nizamabad districts, on behalf of whom M. Appi Reddy, Chairman of the Nizamsagar Ayacutdars Protection Committee, lamented that successive governments had placed priority on Hyderabad's drinking water needs, leaving the farmers in despair. Prominent officials and citizens present at the public hearing included Justice Vaman Rao, a former Judge of the High Court; K. Rajyalaxmi, former Vice-Chancellor of Padmavati Mahila University; and R. Vidyasagar, former Chief Engineer of the Central Water Commission of Andhra Pradesh. The public hearing proceedings were eventually sent to the Chief Minister, Ministers and concerned officials.

Another key public hearing in which ryot leaders and farmers association representatives participated was organized in 2010 concerning the Nizamsagar irrigation project. In the presence of A.D. Mohile, the Irrigation Consultant to the Justice Srikrishna Committee, the former Central Water Commission Member R. Vidya Sagar Rao conducted the proceedings of the public hearing. The farmers from the Nizamsagar project ayacut lamented that the construction of the Singur project has turned out to be more of a curse than a blessing for them. The farmers also expressed a feeling of being cheated out of their water rights. Initially, they were made to believe that the Singur project was to be constructed as a balancing reservoir to stabilize silting problems in the Nizamsagar irrigation project. However, gradually with time, all the water from the Singur Reservoir was eventually diverted to serve Hyderabad's drinking water needs. The farmers further recounted the injustices meted out to Telangana over a period of 54 years under the united Andhra Pradesh and expressed a strong belief that only the separation of Telangana from Andhra Pradesh would solve the problem. The proceedings of the public hearing were further brought to the attention of the Chief Minister's office and officials of the concerned departments.

5.10 Outcomes

To carry out analysis using the IAD framework, it is important to carefully define the objectives of the policy analysis and the analytic approach to be used. Polski and Ostrom 1999: 8) mention two possible approaches. The approach chosen for the present study is generally used when well-established policy situations are to be analyzed, with the focus being on observing and outlining outcomes of activity in the policy arena. This involves working backwards through the flow diagram of the IAD framework to evaluate such policy outcomes. Here, the questions that come into focus include: Where do these outcomes occur? When and why do they occur? Who are the actors involved? The set of outcomes for the study area of Hyderabad have been described in section 5.8. Thereafter, focusing on a particular class of outcomes, relevant patterns of interactions have been identified in section 5.9. At this point, the backward-flowing diagnostic analysis leads with the need to specify the action arena, its physical and material conditions, relevant community attributes, as well as existing rules-in-use. Therefore, the next chapter identifies and examines which factors of the biophysical conditions, community attributes, political-economic context and the rules seem to be affecting the structure of the action arena that produces the outcome under investigation: arbitrary water reallocation in Hyderabad.

6 Determinants of Hyderabad's Arbitrary Water Reallocation

This study was undertaken to examine the key water institutions determining inter-sectoral water allocation in the Hyderabad area and their roles and influence under increasing urbanization, based on the backdrop of prevailing agricultural needs and climate variability. It has aimed at analyzing the reasons for institutional change, seeking to answer the following research questions. Firstly, to inquire how rules-in-use persist despite the rules-in-form already in place. In order to understand this persistence of rules-in-use, an integrated actor and policy analysis was carried out by employing the IAD framework, forming the basis to critically examine the interplay and dynamics of water institutions, the decision-making process and its resulting arbitrary reallocation of water. To this end, the IAD framework was combined with the theoretical foundation of property rights and the identification of exogenous variables to unravel how property rights have changed over time in the study region, leading to such arbitrary water reallocation practices. Secondly, based on Knight's bargaining theory of institutional change, examining the question of why such change has occurred in the study area has been pursued by seeking to identify its causes and the factors which perpetuate it. Both of these research questions have been systematically addressed by using the IAD framework in an iterative process of linking the empirical evidence (chapter five) with the theoretical concepts (chapter three).

To recap the basic aspects of the approach I have employed here, the IAD framework (Ostrom, 1990; Ostrom et al., 1994) provides a platform to analyze variations in institutional form in complexly nested institutional structures, determining the specific choice situations of individual actors. Meanwhile, the institutional economics perspective understands property rights institutions as a result of individual decisions to support specific institutions, as nested within broader institutional structures, and property rights are best understood as occurring within rules whose design is sometimes exogenous to individual decision-makers. These individuals then react to the external rules they are confronted with and can then create other institutions to reallocate the benefits and responsibilities assigned to various goods, depending on the incentives offered by the external institutions. The IAD framework has been employed to examine the persistence of such rule-in-use in spite of already existing rules-in-form in order to examine why arbitrary reallocation of water persists in the Hyderabad area, despite allocation guidelines already in place. Here I analyze how the seven working components of

the action situation, as conceptualized by the IAD framework, appear to be influenced by exogenous variables (physical and material conditions, community attributes, politico-economic context and rules) that either encourage or discourage actor behavior and decision-making processes that eventually cause water reallocation against prescribed guidelines.

6.1 Biophysical Attributes

The previous chapter has highlighted the perpetual conflicts and competition over water between Hyderabad's urban needs and the agriculture sector's for irrigation, often leading to arbitrary reallocation of water against the prescribed allocation guidelines. This chapter specifically examines those factors influencing the perpetuation of such arbitrary water reallocation practices, by examining the institutions in place which facilitate water sharing between the two sectors. In addition, it also discusses how climate variation has been exerting an influence on reallocation.

First and foremost, the reviewed documents in section 5.6 reveal that in Andhra Pradesh the rules and legislations embedded in acts and policy documents defining water access and use between the city and the agriculture sector do not seem to have been formulated from a multi-sectoral approach. For instance, in the Andhra Pradesh Water Resources Development Corporation Act of 1997, the provisions for planning and managing irrigation projects, drinking water supply schemes and industrial supply are all dealt with separately, rather than in an integrated manner. Also, the Andhra Pradesh Water Resource Regulatory Commission Act of 2009 similarly makes no effort towards multi-sectoral provision of water management and regulation. This act authorizes determination of the water requirements for different categories of users independently, rather than taking a holistic approach.

Siddiqui (2008) has similarly reviewed the water policies and frameworks in India, noting that none of the state governments have been equipped with laws that specified the basis for water allocation between different segments of basins which were within their territory. Instead, states have had the liberty to change water allocation not only between but also within a particular system. They have also been free to alter water allocation between users and uses (i.e. drinking water and irrigation or hydropower) at their own discretion, without abiding by any consistent application of rules, regulations and procedures that have been formally defined by law. The National Water Policy of India (2002) did raise concerns about setting up

institutions to deal with multi-sectoral uses of water. However, at that time there were no strategies geared towards how this could be implemented. A decade later, the National Water Policy of India (2012) acknowledged ongoing inter-sectoral disputes in water-sharing and highlighted how such inter-sectoral disputes could potentially strain relationships and hinder better utilization of water. In this regard, it called for an institutional solution to be established within each state to resolve differences between competing water users. However, seriously initiating such a move has yet to be seen among the states, particularly in the state of Andhra Pradesh.

For climate variability and its influence on arbitrary water reallocation, results from secondary data have revealed that water conflicts have been more prevalent during years of drought. Even though the National Water Policy (2012) of India proposed how the impact of climate change on water resources availability should be considered in water management related decisions (Singh et al., 2013), these ideas have yet to be realized and practically implemented in the state of Andhra Pradesh. In order for the rules governing water resources to be effective, they must fit the nature of the resource that is being managed.

6.2 Community Attributes

As already outlined in the previous chapter, the attributes of a community in the action arena (pertaining to a policy action situation) are influenced by the demographic set-up of the community, norms of behavior, level of common understanding, homogeneity of preferences and distribution of resources. The physical and cultural characteristics and attributes of the group of water-related actors in the study context of Hyderabad were examined. I discuss here how the community structure and the interests of each group of actors influences their participation in the action situation and the process of arbitrary water reallocation.

Firstly, community attributes which can facilitate stakeholders to self-organise may be influenced by the size of the group as well as how their race and gender may affect power relations and levels of trust between participants. Collective action may be influenced by the size of a group (Whaley and Weatherhead., 2014: 7). In this regard, this physical attribute of the farming community was given special emphasis through enactment of the AFPMIS Act, 1997. In a bid to reduce the role of government in the direct management of irrigation systems, this Act provided a framework for the setting up of Water User Associations and

fundamentally characterizes and maps the social and structural cohesion of the farming community under review. Data from my interviews with the farming community as well as from media reports have revealed how farmers have organized various ways to secure water for themselves. It is quite evident that, based on the ways they are formally organized through the AFPMIS, it has been easier for farmers to engage in various interactions by employing the five different strategies indicated in section 5.9.

It is also to be noted that the AFPMIS Act made provisions for establishing a highly structured multi-layered system, where the term Farmer Organization (FO) covers different types of organizations in hierarchical order, namely the Water User Association (WUA), the Distributory Committee (DC), and the Project Committee (PC), which essentially organizes committees into small units, breaking down the organizations into smaller groups or number of tiers depended on the size of the irrigation system. Groupings of such smaller units, such as the Water User Associations, theoretically have an advantage in cooperation because the strategies they use are more likely to be clearly observable among them and interlinkages among group members are likely to be more important (Bardhan, 1993; Meinzen-Dick et al., 1997). Analysis of experiences from Asia within traditional WUAs have suggested that it can be more difficult to organize WUAs if they are too large (Meinzen-Dick, et al., 2002).

Secondly, the data reflecting the socio-economic attributes of actors in the study area reveals their dependence on irrigation for agriculture within a hydrologic unit, implying that it is easier for water-related actors in the farming sector to collectively lobby for a common cause. Having the same socio-economic background and addressing the same problem of water scarcity, seems to explain the homogeneity of their preferences regarding distribution of resources. This can also explain how such attributes can influence preferences over policies as well as whether these policies actually operate as intended (Imperial, 1999).

The attributes of the urban water-related actors already described in the previous chapter are much less structurally cohesive, compared to the farming communities. Coming from a wide variety of socio-economic backgrounds, urban citizens in the city are collectively represented by the Resident Welfare Associations (RWA), which are essentially self-managed neighbourhood communities. Municipal Corporators elected in each constituency are generally responsible for overseeing developments in the community, including issues of

access to drinking water. However, there is no administrative provision for formal relations between the Corporators and the Water Board (HMWSSB), which itself is principally responsible for the provision of urban drinking water.

This comparison of the physical and socio-economic attributes of the communities of water-related actors from both the rural and urban sectors – based on the relationship between water scarcity and participation – has helped us to understand and more particularly focus on the collective action of lobbying by farmers. Although such programs to encourage the formation of WUAs have been implemented to increase participatory irrigation management, studies have suggested that they have not only provided a platform to facilitate farmers in calling for a variety of lobbying activities but also strengthened the effectiveness of their lobbying efforts. In other words, they have been influential in giving more credibility to farmers in their interactions with politicians and government officials, especially when demanding a greater voice in decision making (Meinzen-Dick et al., 1997; 2002).

In the study context, lobbying activities are largely directed towards politicians, whose role is indispensable, largely because of the authority vested in them over water resource management by the state through the enactment of various policies and acts over the years, as described in the following. To conclude here, it is the physical and socio-economic attributes of the farming community that places them in a position to organize themselves effectively which, in turn, enables them to successfully take part in the process of arbitrary water reallocation against the prescribed allocation guidelines so as to eventually secure water for themselves. Thus, a key community attribute here is the extent to which potential participants' beliefs, values and preferences about water policy-oriented strategies and outcomes are homogeneous (Polski and Ostrom, 1999:13).

6.3 Rules-in-use

6.3.1 Position and Boundary Rules

Boundary rules outline actors' rights regarding use and management of a resource, specifying who is allowed to manage them. On the other hand, position rules place actors in 'formal' positions, which allow or deny their participation in the management of water resources. Three key inferences can drawn from the boundary and position rules influencing the action situation in the context of Hyderabad's arbitrary water allocation problems. First, ambiguous

and overlapping responsibilities of various water authorities exist in the state. Second, too much power is vested in political actors. Third, although they have made some headway through collective organizing, farming-related actors are still relatively excluded from the management of water resources in Andhra Pradesh. This section attempts to explain how the ambiguous and overlapping responsibilities of water authorities and strengthening of political actors influence arbitrary reallocation of water in Hyderabad.

By virtue of control of water in India being a state matter, the government has the authority to set all rules on water resource management. Hence, it is position rules which order water-related actors and their relations to statutory powers, prescribing the administrative levels at which they act and what roles they play in the policy process of water allocation and management. Various water-related acts in Andhra Pradesh have been critically reviewed here, revealing how the role of the state has been gradually strengthened as well as the ambiguous and overlapping responsibilities of water authorities in the management of water resources in Andhra Pradesh.

The ambiguous responsibilities articulated in the HMWSSB Act (1997) have been well documented in the previous chapter. This act mandates the Irrigation Department and HMWSSB to share control over inter-sectoral water management. It also has provisions for when disagreement between the two authorities arises, whereupon the matter may be forwarded to the Chief Minister, who is also the Chairman of the Water Board. In other words, it opens opportunities for vesting immense power in political actors in the management of water resources in Andhra Pradesh. The previous chapter has also explicitly documented how all arbitrary water reallocations over the years have been facilitated under the influence of the Chief Minister. With regard to the overlapping of water authorities and jurisdictions, in principle, the HMWSSB is supposed to have overall control over its water supply sources and its infrastructure. However, the two key water sources supplying almost 70 percent of total water were previously meant for agriculture and, hence, fall under the control of the Irrigation Department. The conflicts between the Irrigation Department and the Hyderabad Water Board over the issue of water management and allocation, and which have preceded all water reallocations, particularly in the years 2005, 2009, 2010 and 2012, have been well documented in the previous chapter. In a bid to have total control over Hyderabad's water, the Water Board has been making attempts to obtain government approval and financial

assistance for constructing independent structures to convey water, over which it would have complete jurisdiction. This conflict situation confirms Ribot's (2002) observation that conflicts are likely to emerge when the management and use of natural resources normally involve multiple and overlapping responsibilities and jurisdictions, often requiring mediation.

Regarding the non-inclusion of farming actors in water resource management in Andhra Pradesh and its influence on the process of arbitrary water reallocation, let us examine the AFPMIS Act of 1997 as a starting point. The Act made provision for water rights to farmers to manage the water which was already allocated to them; however, they were kept away from the overall management of water issues in the state. The State Water Policy of 2008 required mandating development and management of water resources with the involvement of primary stakeholders, which would also seem to imply stakeholders in the farming sector, who are the greatest consumer of water in the region. However, the Andhra Pradesh Water Resource Regulatory Commission (APWRRC) Act of 2009 tells a different story. The Act was entrusted with carrying out major water planning for all the sectors in the state (such as irrigation, municipal/rural drinking water, electricity and Industry) as well as providing information about how participants should interact in the management of water resources there. However, a role for farmer's organizations was explicitly left out of the planning and decision-making processes. It has been well documented in the previous chapter how the farmers in catchment area affected by arbitrary reallocation appear to have no clue with regard to the availability of water resources.

This reveals a likely reason for the uncertainty of farmers and their feeling of being sidelined, as they perceive that water from the reservoir will come to their fields only after quenching the thirst of the city of Hyderabad. This exclusion of the farming sector in Andhra Pradesh can be countered by the argument of Moote et al. (1997), suggesting the need for a participatory approach where all actors whose interests are affected can participate in the process of natural resource management, which has been increasingly advocated (Rockloff, 2004; Trachtenberg and Focht, 2005). Margerum and Born (1995) also suggest that a participatory approach of including farmers may not only provide a holistic view on the natural resource in question and its problems but, more importantly, bring multiple perspectives together. Such a participatory approach can provide various water-related actors

an opportunity to explore their differences and potentially bring about agreement and the resolution of conflicts (Wondolleck and Yaffe, 2000).

The reviewed documents reveal that, in Andhra Pradesh, the rules and legislation established in acts and policy documents defining water access and use between the city and the agriculture sector have been dealt individually rather than taking an inter-sectoral approach. For instance, the Andhra Pradesh Water Resources Development Corporation Act of 1997 makes individual provisions for planning and managing irrigation projects, drinking water supply schemes and industrial supply, rather than handling them in an integrated manner. Also, the Andhra Pradesh Water Resource Regulatory Commission Act of 2009 similarly makes no effort towards inter-sectoral provision. This act is authorized to determine the water requirements for different categories of users independently, rather than taking a holistic approach.

6.3.2 Authority, Scope and Aggregation Rules

The previous chapter described the provisions laid out within the authority, aggregation and scope rules for Hyderabad. This section explains how the provisions within these rules have eventually influenced the action situation to cause arbitrary water reallocation against the prescribed allocation guidelines. Whilst the authority and scope rules are straightforward, the aggregation rules make for an interesting case. The position and boundary rules for Hyderabad map out water-related actors and their positions with respect to authorization for water management roles and responsibilities, often with overlapping and multiple jurisdictions, primarily between the HMWSSB and the Irrigation Department. Vesting the authority with the Chief Minister to resolve matters in cases of discord between these two authorities represents the aggregation rules here, which essentially determine the level of control in a decision-making process. This immense power vested in political actors – enabling them to facilitate the described arbitrary water reallocation practices – is evident from the field data as well as secondary data. As already explained in the previous section, lessons from Maharashtra need to be learnt, as there the Water Resources Regulatory Authority Act provides for the constitution of a Water Regulatory Authority, the membership structure of which excludes political actors, so as to reduce political interference and Government influence.

6.3.3 Information Rules

In theory, information rules determine the arrangements for interaction and communication between participants in a particular action arena. For instance, interaction may be facilitated through regular meetings between participants and other actors, including stakeholders, the public or other institutions. Such interaction may be channeled through annual reports, public consultations or newsletters. However, the non-participatory nature of the rules and acts imposed in the state of Andhra Pradesh regarding water resource management is clearly evident in the documents reviewed. Farmers – the principle users of water in the area – are kept out of managerial decision-making processes, generally leaving them with relatively no access to factual information about the availability and management of water. This also leaves virtually no chance for farmer groups or representatives (as participants) to inform the interest groups they represent about the process of water management. Thus, the representatives have no way to solicit and respond to the views of the farming community, which would have otherwise enhanced their representative function in the management of water resources in the state (Trachtenberg and Focht, 2005).

Information governing water allocation and use are legally prescribed in government orders and legislation, as already described in the previous chapter. However, the policies and acts provide very little provision as to how such information about the resources management may be disseminated to water-related actors and stakeholders across all communities. Data from my field interviews reveals that farmers have very little information about water availability or management. They perceive that the city's drinking needs are given utmost priority, upon which the rules have been established, and only after the city's needs are met is water given to farmers. They have, thus, been fighting to overturn the prevailing allocation rules. Leaving out the farming group of actors from the management and decision-making process has also blocked grassroots information from coming to light, which could have led to better understanding of the resource for making integrated and holistic water management and allocation strategies. According to Margerum (1999), channels of information exchange and communication can improve decision-making and promote policy-oriented learning when participants share perspectives, preferences, values, resources and goals. Communication, in general, is believed to provide an ongoing process through which all participants verify

information, goals and actions, which is critical to processes such as collaborative natural resource management (Margerum and Born, 1995).

6.3.4 Payoff Rules

Payoff rules generally identify sanctions for taking forbidden actions and determine how costs and benefits are meted out in the action arena. In water regulation, allocation and management, payoff rules determine who should bear the cost of rule violation as well as the benefits of complying with different types of rules in the action situation. This section explains how sanctions for such noncompliance within the provisions of the payoff rules determine how costs and benefits are meted out in the Hyderabad action arena. The interplay of resource dependence and payoff rules that ultimately influence the action area is especially examined and discussed.

The provisions for imposing sanction rules as prescribed in the Andhra Pradesh Water Resources Regulatory Commission Act of 2009 have been well documented in the previous chapter. However, there is a lack of such sanction rules with relation to the rules for inter-sectoral allocation of water between the urban and agriculture sectors in Andhra Pradesh. Studies on water policy in India have raised serious questions regarding the state's authority for regulating the use of water and the manner in which this authority is to be exercised (Sahu, 2010).

Regarding costs and benefits, an institutional analysis distinguishes between physical outcomes, external rewards or sanctions, and the valuations that participants assign to each of these aspects (Ostrom 2005a: 52), meaning how costly various actions could be for each type of participant and what kinds of benefits they can expect as a result of various group outcomes that can be played out in the action situation. In the study context, costs and benefits also vary in terms of their effects, according to the dependence of each group on water, which differs considerably among the resource users.

Data from the farmer interviews I conducted reveals that the farmers in the agricultural sector who share water with the city of Hyderabad are highly dependent on the canal water they receive from the Singur Reservoir. During times of water scarcity, farmers are faced with high costs, as there are no alternative sources of irrigation, which ultimately affects their food

security and livelihoods. In comparison, the city dwellers generally have alternative sources of drinking water through private providers in the city. Therefore, farmers face high costs if they do not plan for securing water for themselves by resorting to various strategies, primarily approaching their political representative with a bargain for water against their electoral support, in other words 'votes for water'. Political actors, on the other hand, due weakly prescribed ‘sanction’ rules, are not hindered by any costs from breaking the rules, although they have been explicitly outlined. Hence, they are in a position to facilitate arbitrary reallocation of water against prescribed water allocation guidelines, as they would likely incur a higher cost of losing out on electoral support if they do not. As explained in the previous chapter, there is strong evidence of electoral politics influencing such arbitrary water reallocation practices, where water released to farmers in the agricultural sector has preceded key electoral milestones.

The Indian constitution vests both the central and the state government claims to having absolute right over water in the country. It is, therefore, not surprising to observe all water-related functions – ranging from developing water resources to its management and the carrying out of regulatory functions as well as conflict resolution – are vested in the executive arm of the government. Hyderabad is also a typical case of this, and the exercising of arbitrary and absolute power by political actors in areas where there is no regulatory provision for sanctions that would limit them is regularly exercised. In reviewing the "Water policies and legal framework in India”, Siddiqui (2008) interestingly observed a similar trend, arguing how vesting too much authority in the state without any limitations prescribed to the exercise of the power at its discretion has created opportunities for arbitrariness. Hence, there is an urgency to vest such authority with bodies that are entirely independent of government, if decision-making processes regarding the creation and change water entitlement rules and allocation are to be made transparent. Some lessons can be learnt from the success story of the South-Indian State of Maharashtra, where the membership structure of the water authority excludes political actors, hence allowing it to operate autonomously from the government of Maharashtra, without any political interference.

7 Distributional Conflict in Rural–Urban Water Contestation

7.1 Conflicts in Arbitrary Resource Allocation

Knight's bargaining theory of institutional change explains institutions as a by-product of conflicts over distributional outcomes, also proposing that conflict is inherent to processes of creating social regulations in the form of institutions that distribute benefits. As Knight (1992) has noted, the role of distributional conflicts to explain formal rules has been explained by a range of authors (Bates, 1990; Libecap, 1989; North, 1990). However, the role of such distributional conflicts with reference to informal rules, norms and conventions has not been given enough attention and, therefore, Knight has generally focused his attention to this area of research.

In this vein, Knight (1992) explains that actors with greater bargaining power will make a full effort to further their distributional goals, while other actors who are dissatisfied with the agreement will try to change it. However, any institutional change will only occur only if and when weaker actors either acquire more bargaining power or the distributional outcome somehow shifts in their favour (Knight 1992: 183). As long as neither change occurs, there will be no substantial change in the agreement, and conflict will continue to persist. Under such circumstances, actors with different power resources continually negotiate resource distribution.

Hence, institutional development is fundamentally influenced by a group's relative abilities to force others to act in ways contrary to their unconstrained preferences in an ongoing bargaining game between actors (Knight, 1992). From this perspective, asymmetries in bargaining power and resource ownership that lead to bargaining outcomes in favour of one of the actors are explicitly brought into focus and the factors that create them are identified and analyzed. Therefore, considering actor bargaining power as a function of their resource provision, various power resources are described here in applying the distributional theory of institutional change with reference to Hyderabad's arbitrary water allocation.

7.2 The Role of Empirically Driven Power Resources in Arbitrary Water Reallocation

a As a result of Hyderabad's increasing urbanization, water being drawn from pre-existing agricultural uses led to persistent conflicts in questioning property rights between these two sectors. Which factors created such asymmetries in bargaining power by water-related actor groups to facilitate such arbitrary reallocation of water is identified and explained.

The empirically derived power resources that emerge in bargaining for water was inferred from the empirical data collected mostly from interviews and secondary literature. The data was linked with the theoretical foundation of the distributional theory of institutional change (Knight, 1992) which suggests that the bargaining power of an actor is a function of his resource provision. It focuses on power asymmetries of actors as the main determinant of institutional change. It may be noted that the empirically derived power resources were inferred and deduced from the variables classified as per the Institutional Analysis and Development (IAD) framework, as most of the variables relevant to the study as prescribed by Knight are similar to that of the IAD framework (Bues, 2011: 79). Hence, it also emphasizes the compatibility in employing Knight's theoretical explanation while using the IAD framework to study the conflicts in natural resource management.

7.2.1 Actor Characteristics: Physical and Cultural Characteristics.

The IAD framework considers community attributes as one of the exogenous variables where their physical and cultural characteristics are determined. Thereafter how these characteristics of different groups influence their participation and decision-making in the process of such arbitrary reallocation in the action arena is examined. The attributes of the community which can facilitate the stakeholders to self-organise may be influenced by their age and gender as well as their race and size of the group. It may be interesting to note how collective action may be influenced by the size of the group or how the power relations and levels of trust may be influenced by gender and race.

The attributes of the farming community were highlighted in the previous chapter with the setting up of the Water Users Association. The attributes of the urban actors represented under the Resident Welfare Associations were however not structurally cohesive as that of the farming communities. It may also be noted that the physical attribute of the community which

can facilitate the stakeholders to self-organise may be influenced by the size of the group; for example, the size of a group generally influences stakeholders' incentives to act collectively. Links were therefore examined between the physical and socio-economic status, to identify the conditions under which farmers were most likely to collectively participate in securing water for themselves.

Regarding the socio-economic characteristics of the farmer's group, the study area is representative of about 72 percent (approximately 30 million) of the population living in the rural areas in Andhra Pradesh, where 62 percent of them sustain their livelihood primarily on agriculture (Reddy and Kumari, 2007). The farmers are generally poor and marginal which is often characterized by their size of fragmented land holdings which is usually below 1 hectare. Such small size is mostly attributed due to further division of land on inheritance. Since agriculture is their primary livelihood, dependence on irrigation is a high priority and becomes a collective issue and a common problem, during water scarcity.

The socio-economic status and structure capturing both the physical and cultural attribute differ markedly among the two competing group of actors. The study revealed a strong structural cohesion of the farming community in contrast to the fragmented social structure of the urban actors. Therefore to conclude, it is the physical and social attribute of the farming community as described above that places the farming group of actors in a position to organize themselves and take part in the process of arbitrary water reallocation against the prescribed allocation guidelines. In this regard, Knight mentions organisabilty of a group as a power resource (Knight, 1992: 197) where their bargaining power depends on their ability and act collectively. In other words, actors capable of organizing and acting collectively have a higher bargaining power than actors that are relatively fragmented.

7.2.2 Resource Dependence

While charting out the attributes of the community in the IAD framework, the characteristics, particularly the socio-economic status throws light on how a particular group of actors' dependence on the resource is likely to influence the action situation in the action arena. In this regard, resource dependence greatly differs amongst the two competing groups of actors. Data from primary (interviews) and secondary (media) sources and information available on

the background of the community in the farming sector revealed their heavy dependence on irrigation for agriculture-based income of farmers within a hydrologic unit.

In the years where arbitrary reallocations occurred, it was particularly during the critical season of paddy transplantation when the Singur reservoir had fallen below the minimum level. This is the period when the inter-sectoral competition for scarce water ensued. Here the farmers came together to partake in process of arbitrary water reallocation, as their livelihood is highly at risk since there are no other alternatives for livelihood if the crop production failed. The farmers' high dependence on water resources, which ultimately puts their livelihood at risks explains Knight's concept of attitude toward risk as a power resource, which is determined by the actor's available resources. Specifically, Knight stated that there exist a dynamics of a positive relationship between ownership of resources and risk acceptance. At the same time, there exists a negative relationship between ownership and risk aversion (Knight, 1992: 133). Actors with the higher provision of resources have a tendency to a higher level of risk acceptance (Knight, 1995: 109).

Therefore, securing water for irrigation becomes very crucial, which is highly contested with Hyderabad's share of water from the Singur reservoir; bearing in mind that water below the prescribed level was to be reserved only for Hyderabad. Most importantly, since water is very specifically required at the particular time of transplantation, timely release of water becomes a critical factor. Time preference according to Knight represents another power resource. Bargaining is expensive and those actors with higher patience i.e. with lower time preference will have advantages in the bargain (Knight, 1992: 135). Due to the farmer's high dependence on water resources, they are typically more risk averse than the competing actor groups in the urban sector. For the urban actors, alternative sources for drinking water are arranged on which their livelihood is not dependent on. In order to save their standing crops, the farmers are therefore compelled to organize themselves to secure water by employing various strategies, amongst which, approaching political actors comes under focus for further discussion in the next section. In this regard, it may be noted that attitude towards risk is also closely linked with exit costs, as a player who has less to loose from a breakdown is more likely to risk it (Knight, 1992: 33) In contrast, a risk-seeking actor is more likely to challenge a commitment which represents a form of bargaining power.

The two factors, time preference and attitude towards risks, have a considerable impact on the exit costs, which were defined as the costs that arise for an actor in case an agreement is difficult to reach or ultimately fails. Farmers pursue to lobby for water because not undertaking such course of lobbying action for water put their agricultural crop to risk, which in turn have a high risk of losing their livelihoods. More importantly, the farmers put great emphasis on the pressure of 'time' to undertake lobbying action for water because water is needed for the crucial seedling and transplanting stages which characterizes their high preference to time.

Hyderabad's case revealed that the power resources attributed to resources dependence (i.e. risk aversion, time preference and exit cost) is inversely proportional to the sanction power. Knight states if an actor is less dependent on the bargaining outcome because he or she possesses sufficient resources, the actor can be more patient to attain an outcome (i.e. he has better power resources as he can survive several rounds). However, because of farmers' high-risk aversion, high time preference and high exit cost as a result of their high dependence on water resources, they exert more sanction powers in negotiating 'vote against water' with political actors, which is left for further discussion in the next section.

7.2.3 Electorate Influence

In the Institutional Analysis and Development framework, analysis of the political-economic as an exogenous variable revealed the ways in which power is distributed among the actors in a management arrangement. How the 'politico-economic' variable affects the action arena depends on how the participants are positioned in the action situation. This variable not only explained the distribution of decision making power among actors who take decisions but also how the political and economic interests have influenced and driven actors' decision within a particular set of rules-in-use (Clement, 2010: 137). The physical and socio-economic attribute and dependence on the resources explained how the collective action of lobbying by farmers is structured. Empirical data revealing five sets of interaction in the previous chapter found that farmers mostly secured water arbitrarily through the lobbying activities largely directed towards politicians. Besides, there are strong evidence of electoral politics influencing such arbitrary water reallocations, where water released to farmers in the agricultural sector has preceded key electoral milestones.

This is typically represented by the data in the year 2010 where Nizamabad district experienced a severe drought condition. This greatly affected the agricultural crops under the catchment area of the Nizamsagar irrigation project which primarily received water from the Singur project, which also catered to Hyderabad city. The farmers of the ayacut were compelled to congregate and approach their political representative of the constituency. It is always within an understanding of how their demand for water in exchange for electoral support is the underlining agenda. In this instance, the political actor representing the famers' interest was Minister for Medical Education, Mr Sudarshan Reddy. The process of negotiation at the higher level involved the Minister meeting the Major Irrigation Minister, the Chief Minister and Irrigation Department officials. He eventually convinced the government to release the water for irrigation, thereby overruling the water allocation guidelines (G.O. 93) as prescribed by the government of Andhra Pradesh.

To break down this process of lobbying to cause water reallocation and infer the power resources that is employed; typically, leaders of the farmers' representative come to negotiating terms with the political representatives of the constituency. Here 'vote in exchange of water' is laid on the bargaining table. Political process is interpreted as a market in which political goods, or institutions, or institutions are exchanged for votes (Meyer, 1996; Hagedorn, 1996). Because of the well-structured organization of the farmer under the umbrella of the Water User Associations, the large rural 'vote bank' that they command becomes crucial. Henceforth the farming actors put forward their demand of water on political actors with their commitment in return for votes in the next election. It has been found that programs such as setting up of water User Association sought to increase participatory irrigation management, also have had additional outcomes. (Meinzen-Dick et al. (1997; 2002) suggested that it not only promoted participatory irrigation management but also provided a platform to facilitate farmers to call for a variety of lobbying activities. This may have attributed towards strengthening the effectiveness of lobbying efforts by giving more credibility to the farmers in interacting with the politicians and government officials. In such a process, it has facilitated the farmers to demand a stronger voice in not only for access to the resources but also in decision-making in natural resource management.

In this regard, Knight explains that sanctioning is a mechanism that ensures commitment. In general, sanctions reduce the expected benefits of non-compliance; where farmers pledge "we

will not vote for you if you don't give as well as keep your commitment to give us water" and make compliance a more beneficial long-term strategy (Knight, 1992: 179). In other words, sanction power refers to the threat of sanctions imposed by one actor (farmers) on the other (political actors) in the case of non-compliance. This threat influences the bargaining situation of the threatened actor (political actors) to the benefit of the threatening actor (farmers group). Under the threat of sanctions for non-compliance, compliance to informal rules (by the politicians) becomes a rational long-term strategy (Knight, 1992: 179). The threat of retaliation implies the ability of an actor to influence the extractable benefits of the other actor as in the case of bargaining breakdown or distributional disadvantage. Again, the question arises whether this strategic threat is credible or not. Credible commitment is a believable attitude demonstrated by actors that they will in fact do what they claim. For instance, farmers in the past have voted in favour of a particular

Table 7-1: Actors' Characteristics Impacting on Power Resources

Actor Characteristics	Power Resources	Rural	Urban
Physical and Cultural	Organizability	High	Low
Resources Dependance	Risk Aversion	High	Low
	Time preference	High	Low
	Exit cost	High	Low
Electorate Influence	Sanction power	High	Low
	Credibility	High	Low

Source: adapted from Theesfeld (2005: 78)

It is interesting to note that some power resource (with negative outcome) can inversely amplify the other power resources. For instance, in Hyderabad's case, the power resources attributed to resources dependence (i.e. risk aversion, time preference and exit cost) is inversely proportional to the sanctioning power. However, Knight stated if an actor is less dependent on the bargaining outcome because he or she possesses sufficient resources, the actor can be more patient to attain an outcome. In other words, he has better power resources as he can survive several rounds (Knight, 1992: 132). However, empirical data reveals that because of farmer's high risk aversion, high time preference and high exit cost as a result of

their high dependence on water resources, they exert more Sanction powers in negotiating ‘vote against water’ with political actors.

8 Conclusions

The competition and conflict of Hyderabad's urbanization and its inter-sectoral water contestation with agriculture was the focal attention of this study. Water allocations between these two competing sectors were administratively prescribed with allocation guidelines in place. However, arbitrary reallocation of water against the prescribed guideline persisted over the years with detrimental consequences for both the sector. In this light, this study examined the institutional context of the 'water allocation mechanism' in place. It specifically examined the dynamics of the 'water allocation mechanism' and the underlying process of interplay of water-related actors and rules and dynamics of factors which eventually propagated such arbitrary water reallocations. Within the backdrop of change in the dynamics of urbanization, agriculture and water variability, the key research question addressed was *"how has the water-allocation mechanism in place propagated the way rules and actors currently interact to influence and employ strategies that eventually causes arbitrary reallocation of water resources?"*. This study unravelled the factors of how and why water-related actors break formal rules, to create their own rules and eventually play their own game of water allocation in Hyderabad's context.

The key research question of why such arbitrary reallocation persists against the allocation guidelines was translated into Ostrom's language, i.e. to examine the persistence of rules-in-use, despite the rules-in-form already in place. The Institutional Analysis and Development (IAD) framework developed by Ostrom (1982; 1990; 2005; 2011) was employed for this study, as it provided a good platform for guiding such research studies of rules-in-use and rules-in-form. In addition, Knight provides a good explanation of human interaction in the context of such conflicts over limited resources (Acheson and Knight, 2000; Theesfeld, 2004). Therefore the study used Knight's (1992) concept to deduce the power resources of the water-related actors for securing the contested water in the study context. Overall the study employed the theoretical explanations of property rights within the realms of the IAD framework and made an attempt to provide a case on the applicability of contemporary theories of institutional change to the context of water resource management in Hyderabad.

Empirical field work for data collection was carried out under the catchment area of irrigation projects affected by the water reallocations. Interviews were also collected from a wide range of water-related actors in the state of Andhra Pradesh (Please see Annexure no 1. List of Interviewees). In addition, the content of the relevant policy documents as indicated in

Chapter four was critically analyzed. In the process of understanding why such arbitrarily water reallocation took place, the study conceptualized water rights as property rights (based on allocations rules). The process and the influencing factors of 'how' property rights change over time, was conceptualized within the institutional perspective of property rights explained through the IAD framework. The factors which influenced the process of arbitrary water reallocation were determined by employing the variables prescribed by the IAD framework. Thereafter to understand 'why' property rights change over time, this study employed Knight's distributional theory. It explained determinants of institutional change by taking the concept of Knight's power resources, which facilitated such arbitrary water reallocations.

8.1 Empirical Conclusion

8.1.1 Lack of 'Inter-sectoral' Element and Climate Variability in Water R-source Management

The empirical data revealed numerous factors within the biophysical attributes that led to such arbitrary water reallocation. Amongst which, the increasing urbanization of Hyderabad and its water needs has not been holistically integrated with the water needs of the agricultural sector. It has instead been marred with ambiguous and overlapping responsibilities of water jurisdictions. Andhra Pradesh being predominantly semi-arid, it has experienced unpredictable drought over the years, whereby it also gave rise to such conflicts. In general, when scarcity of resources increases, inter-sectoral tension builds up between competing users and attempts are made to look into institutions to oversee the sound utilization of water in large water units.

The idea of setting up a separate authority at the state level for water regulation, was to take charge of managing water resources in an integrated manner by coordinating water use by different sectors was taken up in Andhra Pradesh. This was in the form of the Andhra Pradesh Water Resources Development Corporation Act which was implemented in 1997. However, it has not been successful to contain these inter-sectoral conflicts. In this regard, the National Water Policy (NWP) issued in 2002 has a clear indication of the need for planning and setting up institutions and governance structures capable of dealing with multi-sectoral water uses. However, there was no concrete suggestion how to actually implement it at the state level.

Recognizing such conflicts and contestation of water resources between the competing users, with increasing water scarcity, attempts were made to address the issue within National Water

Policy 2012. It suggested a mechanism be established within each State to amicably resolve differences in competing demands for water amongst different users of water. However, to date, such institutions and governance structure have not been put in place in the case of Andhra Pradesh. Regarding the inter-sectoral water conflicts in context to climate variability; it is paramount to understand that the significance of climate variability. Contestation for water increases as the availability of water resources decreases, which is highly dependent on the erratic monsoons pattern as in Andhra Pradesh.

The National Water Policy of 2012 acknowledged the way in which climate change is going to impact on water resources availability. The policy, therefore, addressed the need to consider the variability and impacts climate change into decisions related to water management. However, in the case of Andhra Pradesh, it is far from any mention in any state water policies, acts or regulation. In regard, what actions (of water allocation and management between the city and the agricultural sector) are authorized to be carried out by actors in position is clearly laid out within the provision of authority rules of the IAD framework. The scope rules within the IAD framework stated water beyond a prescribed level not to be supplied to the agricultural sector but reserved only for drinking needs of the Hyderabad. However, this prescribed limit does not consider the possibility of climate variability.

In addition, the National Water Policy of 2012 acknowledged the anticipated increase in variability in the availability of water because of climate change. Therefore it advocated the need for increasing water storage in various forms. In the state of Andhra Pradesh, there is a huge potential for rain-water harvesting technology. However, not much space has been given in policy discussion yet. Whilst theoretically, the potential of rainwater harvesting, even in semiarid areas such as Hyderabad (with an annual rainfall level of 700-850 mm), is enormous (Narain, 2006). George et al. (2009: 695) show that in an average rainfall year in Hyderabad, 80,000 liters of water can be generated from a 100 square meter roof area. This can potentially meet 35 percent of the domestic demand annually. Expert interview from Member of Central Water Commission revealed how water policy and reforms in the state of Andhra Pradesh have paid little attention to rainwater harvesting techniques due to the lack of governmental incentives. For instance, rainwater harvesting is optional non- mandatory under the urban renewal plans in Hyderabad. The government's withdrawal of the 50 percent subsidy on structures related to the Hyderabad rainwater harvesting initiative (HMWSSB, 2008; JNNURM, 2011) reflected a lack of governmental support and incentive.

8.1.2 Participation: Too little of the Farming Community and too much of the Political Actors

The exogenous variable in the IAD framework determined the provision of the participation (or non-participation) of water-related actors within the position, boundary and aggregation rules. The water policies, both central and the state made clear provision for inclusive participation within and across all stake holders and water related actors. At the state level, the Andhra Pradesh State Water Policy of 2002 made clear provision for "Mandating development and management of water resources with the involvement of primary stakeholders for efficient and optimal utilization of water through progressive re-engineering and reorientation of institutions, practices and processes". The National Water Policy 2002 also advocated for a participatory approach to Water Resources Management "by involving not only the various governmental agencies but also the users and other stakeholders, in an effective and decisive manner, in various aspects of planning, design, development and management of the water resources schemes"

However various acts and reforms in Andhra Pradesh reflected differently. The landmark AFPMIS Act was implemented to hand over management powers of water to the farmers. This Act made way for the formation of Water Users Associations (WUAs) with statutory powers to collect and retain a portion of water charges, manage the volumetric quantum of water allotted to them and maintain the distribution system. However, they had their management jurisdiction only once the water entered the canal, and kept out from the overall water management in the state. The Andhra Pradesh Water Resource Regulatory Commission Act of 2009 further alienated the farmer's group by excluding them from any planning process and decision-making process, but only to be invited for meeting at the regulatory authority's discretion.

In contrast, the participation and authority of political actors in water resource management in Andhra Pradesh have progressively gained control over the years. In India traditionally, it is the government and ministries which are vested with responsibilities for water resources regulation. However, In India, the water underwent a process of reforms where it considered water as an economic good. It, therefore, pushed towards the adoption of the institutional framework, where some of the functions as well as the regulatory powers vested in government departments and ministries were to be transferred to water regulatory authorities

which were to be either autonomous or independent. The regulatory authority was to be vested with power and authority to exercises rule-making, as well as implementing and settling disputes relating to these rules. The core idea behind setting up such sector-specific regulatory authorities was to ease away from government and political interference, as well as to encourage and facilitate the participation of water management from the private sector.

However, in the APWRRC Act (2009) the functioning of the regulatory authorities was entrusted to civil servants; as a result, it compromised the independence of the authority. The act was entrusted to carry out major water planning for all the sectors in the state (such as irrigation, municipal/rural drinking water, electricity and industry). It was also entrusted to provide information about how the participants should interact in the management of water resources in Andhra Pradesh. The role of farmer's organizations was explicitly kept away in the planning process and decision-making process. In other words, it further vested more authority to political actors over water resource management in the state of Andhra Pradesh. Further, the Water Resources Development Corporation constituted in 1997 on the contrary, strengthened the role of the State. It had made provision for the members of the Corporation to be state officials or be elected by the Government. The HMWSSB was constituted in 1989 to operate and manage Hyderabad's water independently. However, provision was made to grant joint-authority with the Irrigation Department since the water supply for the city was sourced from irrigation sources, which were under the control of the Irrigation Department. It further made provision that in the case of disagreement between the Irrigation Department and the Water Board, the matter was to be taken up to the Chief Minister who was vested with the authority to eventually resolve the issue.

In this regard, it is interesting to report the case of water law reforms in the neighboring State of Maharashtra and Uttar Pradesh, passed their own Water Resources Regulatory Authority Acts, which provided for the constitution of a Water Regulatory Authority. Unlike in the case of Andhra Pradesh, the membership structure of the Authority excluded any Member of Parliament or Legislature of the state. It called for the holder of a post in any political party to be ineligible and be disqualified from membership of the regulatory commission. This was put in place in order to keep away from interference and influence from both the political and the Government functionary.

8.1.3 Weak Sanctions for Water Management and Regulation

The case of Hyderabad revealed that too much power was vested in political actors, while the farmer's group was largely kept out of the decision-making process in water resources management in the state of Andhra Pradesh. There is enough evidence to reveal numerous violations of the prescribed allocation rules facilitated by political actors over the years. In this regard, it is important to note that the Andhra Pradesh Water Resource Regulatory Commission enacted in 2009 had the provision to impose sanctions for non-compliance with rules.

Here the Commission was obliged to recommend to the Government a disciplinary action against officials in case of non-compliance of the specific directions in the discharge of the powers under this Act. However, there is no indication how this should be implemented in various government orders in management and allocation of water resources. Vesting too much of authority on the state without any limitations prescribed to exercise power at its discretion has created opportunities for persistent arbitrariness in regulation, management and decision-making process.

An overall conclusion may be drawn that discordance between central and state policies exists. According to the constitution, a joint jurisdiction between the central and the state government is in place to manage water resources. Various states have their own legal position on ownership of water. This has led to the absence of uniform laws and policies on water management in India, which remains largely uncoordinated. The study revealed that considering the central policies of water resource management has given a lot of attention to issues ranging from planning, development and management of the water resources taking into consideration intersectoral, multi-disciplinary and participatory approach. It called for the need to appropriately reorient the existing institutions at various levels under the water resources sector or even create new institutions, wherever necessary. However, in line with Siddiqui's (2008) argument, various states have their own legal position on ownership of water, where none of the state governments has existing laws specifying the basis for water allocation between different users within the basins falling within their territories. States have had the liberty to change the allocation of water between users and uses at their discretion (for instance, between irrigation and water supply) without observing any consistent application of well-defined rules of management, procedures and implementation laid down by law.

8.2 Theoretical Implications

Araral and Yu (2012: 7) pointed out that, studying water governance particularly conflict in allocation and use of property rights inherently involves a political dimension, yet not much attention has been laid on the politics of water governance in the existing literature. Therefore, this study attempted to empirically analyze the political dimension and the dynamics involved in the arbitrary reallocation of water resources by employing Knight's (1992) concept in understanding such resource conflicts, and how one actor group secure the resources over the other actor group.

First, in order to facilitate the political dimension of such arbitrary resource allocation, this study adapted the 'politicized' IAD framework, adding the 'politico-economic' context as the fourth exogenous variable as illustrated by Clement (2010) in analyzing natural resource governance in Vietnam. This fourth exogenous factor not only assisted in identifying 'political' elements and associated relationships that should be considered for institutional analysis (Ostrom, 2005), but also used to create a coherent structure for inquiry to empirically define the dynamics of political influence as a 'power resource' in rural-urban water governance by taking the case study of Hyderabad.

This variable helped to understand the distribution of decision making power among actors who essentially made decisions. It highlighted the influence of the political and economic interests in such a decision-making process, within a particular set of rules-in-use (Clement, 2010: 137). The 'politicized' IAD framework was developed to explicitly bring focus to political dimension in policy analysis in natural resource management. Here, the role of political interplay in the natural resource management is diagnosed early on and further lays emphasis when examining natural resource management and allocation in rural-urban context.

Secondly, the study characterized the concept of bargaining power in various ways which Knight (1995) mainly referred to resource ownership. The study identified power resources as being important pertaining to analyzing an actor's bargaining power to secure the contested water resources. According to Knight, If an actor scored low in most of these power resources in relation to the other actor, it is understood that bargaining does not take place, and the stronger actor decides about how and which rules are to be implemented.

However, in the Hyderabad's case study, empirical results have revealed how some power resource (with a low score) can inversely amplify the other power resources. For instance, the

power resources attributed to resources dependence (i.e. risk aversion, time preference and exit cost) is inversely proportional to the sanction power. Knight stated that if an actor is less dependent on the bargaining outcome because he or she possesses sufficient resources, the actor can be more patient to attain an outcome. In other words, he or she has better power resources on three accounts of risk aversion, time preference and exit cost, which enables the actor to survive several rounds. However, the empirical data revealed that because of farmer's high-risk aversion, high time preference and high exit cost as a result of their high dependence on water resources on which their livelihood depends, they exerted more sanction powers in negotiating 'vote against water' with the political actors.

Thirdly, the electorate of people as one of the power resources, which the study inferred as the key factor in negotiating for water, needs to come to the forefront whilst examining rural-urban conflicts in natural resource management. In consistent with the findings by Celio (2007) in Hyderabad's context, because of the way the farmer's groups were organized, it was found that supplying water in fulfilling the needs of Hyderabad brought about lower electoral payoffs when compared to providing farmers with water.

8.3 Policy Implications

The central government water policy espouses the need to adopt a multi-sectoral perspective. Provision for inter-sectoral allocation and management of water resources in Andhra Pradesh which is dealt independently, need to have an integrated and holistic approach. Therefore appropriate central directives should be put in place to streamline for the individual state legislations to take leadership towards this direction in managing their water resources.

The central government water policy espouses the need to consider the impact of climate change and its effects on water variability, and availability in water resource management. The state of Andhra Pradesh, in order to handle water conflicts in event of monsoon uncertainties, should formulate policies pertaining to water resource management, as appropriate. Augmentation of water through the direct use of rainfall which indicates tremendous potential in the city should be implemented.

The central government water policy advocates the need for a participatory approach to Water Resources Management and encourages the involvement of not only the governmental agencies but also the users and multitudes of stakeholders. The state of Andhra Pradesh needs to consider curtailing the authority vested on state actors and increase farmer's participation,

taking lessons from Maharashtra and Uttar Pradesh. Water Resources Regulatory Authority Acts should have provision to exclude any Member of Parliament or Legislature of the state. It should call for the holder of a post in any political party to be ineligible and be disqualified from membership of the regulatory commission. Strong sanctions rules, in the case of non-compliance, while exercising authority for water management, also need to be put in place with robust enforcement mechanisms.

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Annex

Annex 1: **List of Interviewees**

Sl	Respondent name	Designation	Category	Interview mode
1	Dr. K.Thirupathaiah	Director General Water and Land Management Research and Training institute-Department of Irrigation, AP	Government	Face to face
2	Sri. Ram Reddy	Executive engineer Department of Irrigation Singoor Project, Medak Dist. Andhra Pradesh	Government	Face to face
3	Dr. Rao V.B.J. Chelikani	President United Federation of Resident Welfare Associations, Hyderabad	Civil Society	Face to face
4	Sri. CH.Balraj	Executive Engineer, IB, Sangareddy, Dept. of Irrigation	Government	Face to face
5	Sri. Panduranga Rao	Telangana Matti Manishi Venepally	Farmer Association	Face to face
6	Sri Parameshwaran	Member, Resident Welfare Association, Hyderabad	Civil society	Face to face
7	Sri. R. Vidyasagar Rao	Irrigation adviser and former chief engineer of Central Water Commission, Hyderabad	Expert	Face to face
8	Dr. Suhas P Wani	Principal Scientist The International Crops Research Institute for the Semi-Arid Tropics, Hyderabad	Research Institute	Telephonic
9	Floriane Clement	Researcher-Institutional and Policy Analysis, International Water Management Institute, (IWMI) Hyderabad	Research Institute	Face to face
10	Sri. Krishna Kakumanu	Special Project Scientist International Water Management Institute, (IWMI) Hyderabad	Research Institute	Face to face
11	Dr. V. Ratna Reddy	Director Livelihoods and Natural Resources Management Institute	Research Institute	Face to face
12	Sri. Y Vishnu Murthy	SGA PandA (HMWSSB) Hyderabad Metropolitan Water Supply and Sewerage Board	Government	Face to face

13	Dr. Priyanie Amerasinghe	Senior Researcher International Water Management Institute, (IWMI) Hyderabad	Research Institute	Telephonic
14	Sri. Celio Mattia	Science and Technology Counselor Embassy of Switzerland , New Delhi	Expert	Face to face
15	Sri. Sayed Yusuf Ali	Project Director Mission for Elimination of Poverty in Municipal Areas (MEPMA), Andhra Pradesh	Expert	Face to face
16	Dr. M. Devender Reddy	Director Water Technology Centre ANGRAU Rajendranagar Hyderabad	Academia	Face to face
17	Dr. Padmanabha Rao	Associate Professor Centre for Economic and Social Studies (CESS)	Reserach Institute	Face to face
18	Prof. C. Ramachandraiah	Professor Centre for Economic and Social Studies (CESS)	Reserach Institute	Face to face
19	Sri. Reddy	Sup. Engineer Department of Irrigation, AP	Government	Face to face
20	Ms.Meghna	Asst. Engineer (Mechanical) APGENCO – Andhra Pradesh Power Generation Coop Ltd	Government	Face to face
21	Sri. Srinivas	Village: Rampur, Kulcharam mandal, Medak Dist	Farmer	Face to face
22	Sri.T.Sidda Goud	President Primary Agricultural Co-op Society Village: Rampur, Kulcharam mandal, Medak Dist	Farmer	Face to face
23	Sri.Srinivas	Local Reporter Andhra Jyoti Village: Rampur, Kulcharam mandal, Medak Dist	Media	Face to face
24	Sri.N. Reddy	Kulcharam mandal, Medak Dist	Farmer	Face to face
25	S. Narisimlu	Work Inspector, Ghanpur Irrigation Project Irrigation Department, Govt. of A.P	Government	Face to face
26	Sri. Srinivasulu	Village: Ghanpur Village, Tupran Mandal, Medak District	Farmer	Face to face
27	Sri. Murthy	Village: Ghanpur Village, Tupran Mandal, Medak District	Farmer	Face to face
28	Sri.Bangara	Village: Ghanpur Village,	Farmer	Face to face

		Tupran Mandal, Medak District		
29	Sri. Sudhakar	Village: Ghanpur Village, Tupran Mandal, Medak District	Farmer	Face to face
30	Sri. Dattahi	Asst. Executive Engineer Dept. of Irrigation,Nizamsagar Irrigation Project	Government	Face to face
31	Ms.Sanghamitra Malik	Forum for a better Hyderabad	Civil Society	Face to face
32	Dr.Jasveen Jairath	Forum for a better Hyderabad	Civil Society	Face to face
33	Ms. Sreoshi Singh	Research Fellow Saci WATERS	NGO	Telephonic
34	Dr. Geetha Reddy Anant	Professor of geography Osmania University, Hyderabad	Academia	Face to face
35	Sri.P.Shravan Reddy	Banjara Hills, Hyderabad	Politician	Face to face
36	Dr. Biksham Gujja	Founder and Chairperson AgSri Agricultural Services Hyderabad	NGO	Face to face
37	Sri. Reddy	Sup. Engineer Department of Irrigation, Gov. of Andhra Pradesh	Government	Face to face

Annex 2: G.O. (Ms). No.93 Singur Dam- Reservoir Operating Rules

GOVERNMENT OF ANDHRA PRADESH
ABSTRACT

HYDERABAD METRO POLITAN WATER SUPPLY AND SEWERAGE BOARD - Hyderabad - Water Supply and Sanitation Project with World Bank Assistance - Singur Dam - Reservoir Operating Rules - Issued.

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IRRIGATION & C.A.D. (Irrgn. IV) DEPARTMENT

G.O.(Ms). No.93, Dated: 24-02-1990
Read the following:-

(1) Letter No.CE/HMWS/PC/23-D/1420, dated: 22-3-89, from the Chief Engineer, H.M.W.S.
(2) Letter No. Rc.(H&S)C4/Singur/89, dated: 14-3-89, from the Chief Engineer(Investigation), Irrigation Department.
(3) G.O.(Ms) No.190, M.A., dated: 1-12-1989.
(4) World Bank Telex, dated: 1-12-1989.
(5) Letter No.Rc(H&S)/C4/Singur/Vol.V/89, dt: 30-12-1989 from the Engineer-in-Chief, Irrgn. Wing.

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ORDER:-

Manjira Water Supply Scheme Phase-III has been taken up for additional supply of 300 MLD (4 TMC) of water to twin cities of Hyderabad and Secunderabad with Singur Reservoir as source. Singur Dam was constructed by Irrigation Department to meet the said requirements for the twin cities of Hyderabad and Secunderabad and to stabilise the Irrigation under existing Nizamsagar, Fatehnagar and Mahaboobnagar systems.

2. The Chief Engineer (Investigation), Irrigation Department conducted studies of flow regime of Manjira river at Singur Dam. These studies were reviewed by the Dam Review Panel of Singur Dam which suggested to consider 10% regeneration from the upstream utilisation projects. Accordingly the Chief Engineer (Investigation) has revised the studies of the flow regime by taking 10% regeneration from projects of more than 3TMC capacity.

3. The inflows indicated in the statement appended to G.O. third cited are arrived after taking into consideration the probable upstream utilisation of all the existing projects and also the proposed utilisation in future as per the award of the Godavari Water Disputes Tribunal. Considerable time will pass before full utilisation of upstream share of water. As a consequence, the present flows and the flows in the near future at Singur Dam could be more than the flows indicated in the statement appended to G.O. third cited.

4. The working table with 75% dependability appended to G.O. third cited has been worked out taking the capacities with 50-year situation period. Hence the capacity of the reservoir above MDDL would be more than the capacity considered in the working tables.

5. World Bank suggested that the working tables be based on estimates of inflow and sitation for a period of fifteen years, i.e., till the year 2005. World Bank also suggested that the losses between Singur and Manjira Barrage be taken into consideration.

6. The sedimentation analysis is done as per the suggestions of the World Bank by the Chief Engineer (Investigation) upto the year 2005 and the capacity tables prepared based on the above suggestions, which are incorporated as Annexure-I.

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7. The upstream utilisation is estimated at 38.36 TMC by 2005 and the basis is given in the Annexure-II.

8. Manjira Barrage from where the existing water supply drawn for Manjira W.S.S. Phase-I and II, is situated 26 Kms. downstream of Singur reservoir. The evaporation and seepage losses from Singure Reservoir to Manjira Barrage will be compensated by the yield from the intermediate catchment. Hence it is not considered.

9. World Bank suggested that the flow series indicate the need for considering a minimum period of consecutive two years for preparing working tables instead of a single year in isolation.

10. The preparation of working tables taking into full account upstream utilizations, reasons for anomalous pattern of inflow series, for deciding when and in what quantity release would be made for irrigation purposes, takes some more time. Therefore, World Bank has suggested to give a practical effect to the policy of giving first priority to drinking water supply to twin cities of Hyderabad and Secunderabad, by framing Operating Rules, in a two step approach.

11. In the first step "Interim Reservoir Operation Rules" will be issued. This first step would be followed by the preparation of "Operating Rules" based on further studies at a later date.

12. Inflow series reveal that year 1977-78 alone has an inflow having a 92% probability of occurrence and further that the years 1976-77 and 1977-78 together represents the two-year sequence having the same probability of occurrence. Hence the two year period from June, 1976 through May, 1978 is selected for analysis for the purpose of preparing the "Interim Reservoir Operating Rules".

13. The net inflows for 1976-77 and 1977-78 are arrived at 21.39 TMC and 10.66 TMC (including 10% regeneration) and the details are given in the Annexure-III.

14. The working tables for the year 1976-77 and 1977-78 are worked out backwards on a month to month basis assuming that the reservoir level as +513.50 at the end of May, 1978. The working tables are enclosed as Annexure-IV.

15. The working table for 1976-77 shows water levels below the MDDL of 518.25 during June, July and August. In order to ensure water supply to Manjira Phase-III, a minimum level of +518.25 shall have to be maintained during July and August and +513.50 in June.

16. The Government, having carefully examined all the above aspects, issue the following "Interim Operating Rules" for Singur Dam to ensure proper and timely releases of water for water supply to twin cities through Manjira Water Supply Scheme.

a) On 1st June of every year, minimum level in the Singur Dam shall not be less than +518.50 M.

b) To release a total quantity of 6.96 TMC of water continuously for the whole year to Manjira Water Supply Scheme Phase-I, II and III.

c) The Singur reservoir levels to be maintained on the first of every month have to be as hereunder.

Month	Level
June	+518.50
July	+518.25
August	+518.25
September	+520.179
October	+521.417
November	- 521.270
December	+521.111
January	+520.869
February	+520.586
March	+520.254
April	+518.868
May	+519.469

17. Water for Irrigation shall be released only when the water levels are higher than the minimum levels indicated in para 16(c).
18. Government hereby constitute a Committee with the following members for reviewing and implementing the interim operation rules, keeping in view the inflows in a particular year.
    1) Principal Secretary/Secretary, Irrigati9on Chairman
    2) Principal Secretary/Secretary, HMA&UO Member
    3) Engineer-in-Chief, Irrigation Member
    4) Chief Engineer (Major Irrigation) Member
    5) Chief Engineer, Hyderabad Metro Water Supply & Sewerage Board. Member/Convener
19. The above operating rules shall come into effect from 1-7-1993.

(BY ORDER AND IN THE NAME OF THE GOVERNOR OF ANDHRA PRADESH)

K. MADHAVA ARAO
PRINCIPAL SECRETARY TO GOVT.

To
The Principal Secretary to Government, Irrigation Department.
The Engineer-in-Chief, (I.W.) Errum Manzil, Hyderabad.

// f.b.o. // Sd/-
SECTION OFFICER
